GCSE MARKING SCHEME

JANUARY 2016

APPLICATIONS OF MATHEMATICS
UNIT 2 - HIGHER TIER
4362/02

INTRODUCTION

This marking scheme was used by WJEC for the 2016 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was 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 conference was to ensure that the marking scheme was 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' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

GCSE APPLICATIONS OF MATHEMATICS
UNIT 2 - HIGHER TIER

MARK SCHEME – JANUARY 2016

Applications Unit 2 Higher Tier January 2016		Final
1(a) $760 + 0.26 \times 760$ or 1.26×760 or equivalent (£) 957.6(0)	M1 A1	
(b) Greatest 26.5 (cm) Least 25.5 (cm)	B1 B1	Accept 26.499999… Do not accept 26.49
(c) $460 - 0.16 \times 460$ (= $460 - 73.60$ =386.4(0)) $386.4 - 0.16 \times 386.4$ (= $386.4 - 61.82(4)$ =(£)324.576) (£)324.58 or (£)324.57(.)	M1 M1 A1 7	OR M2 for 460×0.84^2 or M1 for 460×0.84 (=386.4) FT their 386.4, but not 460 CAO. Penalise further working -1 *Total marks to award for common errors:* *Appreciation: SC1 for 533.6(), (£)618.97(6)* *Simple depreciation: M1 for 312.8(0)*
2(a) (£)36000 or (£)36 thousand	B1	B0 for 36
(b) Advertising (£) 8 000 or (£)8 thousand AND Sales (£) 30 000 or (£)30 thousand (and indication on the scatter diagram)	B2	B1 for 8 AND 30 or appropriate indication on the diagram
(c) Line of best fit with appropriate trend shown	B1	
(d) Use of their gradient of the line of best fit Gradient answer in the range (£)5 to (£)8	M1 A1	When indication on the diagram or working seen, allow SC1 for an answer derived from use of ratio or proportion sales : advertising for any point (other than company (b)) or a point on the line of best fit, or sales £1000s / advertising £1000s
(e) (i) Conclusion, e.g. 'yes selling more the more money spent', 'don't know as only 11 companies asked', 'yes, as there is positive correlation'	E1	Allow 'a product may not be successful if not advertised'
(ii) Next step, e.g. 'gather more data', 'ask more companies'	E1 8	Do not accept 'ask more people' as this is about shampoo companies, so this standard answer to data questions is insufficient unless accompanied by further relevant detail

<table>
<tr><th>Applications Unit 2 Higher Tier January 2016</th><th></th><th>Final</th></tr>
<tr><td>3(a) $BC^2 = 20^2 + 35^2$
$BC^2 = 1625$ or $BC = \sqrt{1625}$
$AC^2 = 25^2 + BC^2$

$AC^2 = 2250$ or $AC = \sqrt{2250}$
(Lengths are)
(BC=) 40(.3cm), (AC=) 47(.4cm) (and AB= 25cm)

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>M1
A1
M1

A1

A1

QWC
2

7</td><td>

FT 'their BC' for M1 only
M1 and m1 may be combined
FT their derived BC

CAO. Accept given in surd form

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(b)(i) G4 588
D5 8

(ii) 407 ÷ 18.5(0) (= 22)
(22 – 6 – 2)÷2
7

(iii) (G3 =) B3 * (C3 + D3 + E3 + F3) or equivalent

(iv) (G8 =) G3 + G4 + G5 + G6 or equivalent</td><td>B1
B1

M1
m1
A1

B2

B1
8</td><td>

FT 'their 22' if M1 awarded
CAO
Alternative:
407 - 8 × 18.5(0) (=407 – 148 = 259) M1
(259 ÷ 18.5(0)) ÷ 2 (=14÷2) m1
FT 'their 259' if M1 awarded
7 CAO A1

B1 for 25 * (C3 + D3 + E3 + F3) or
for B3 * C3 + D3 + E3 + F3 or
for an appropriate expression with 1 error

FT their G3</td></tr>
<tr><td>3(c)(i) Carba (boots)
Kata (boots)

(ii) Male with size <7 or equivalent

3(d)(i)
<table><tr><th></th><th>Median</th><th>Range</th><th>Mode</th></tr><tr><td>Europe</td><td>2</td><td>11</td><td>1</td></tr><tr><td>America</td><td>11</td><td>21</td><td>12</td></tr></table>
(ii) Statement, e.g. 'no, it may seem that way because each customer in America buys a lot of boots', 'could be, but it's only based on one day', 'no, as both America and Europe have orders as single digits (as well as in the 10s), 'no, as Americans just buy more boots',</td><td>B1
B1

E1

B3

E1

7</td><td>

Accept, 'anyone wanting a size 9 or above', or 'anyone wanting a size 4 or below' or 'males are not offered a long or short style of boot'
Do not accept examples, e.g. 'male size 5'

B2 for 4 or 5 correct entries
B1 for 2 or 3 correct entries

Allow 'yes (it seems that way) as many customers in Europe buy 1 pair whilst someone in America bought 23 pairs' – there must be a Europe / America comparison.
Allow 'yes (it seems that way), as the average for America is much higher' WITH either a reasonable attempt to calculate both means OR with reference to the medians</td></tr>
</table>

Applications Unit 2 Higher Tier January 2016		Final
4(a) 60:96 considered, e.g. sight of 96/60 or 1.6 80 × 96 ÷ 60 or equivalent 128(p) or (£)1.28 (b) (96cm laces weigh 8 × 1.6 or 8 × 96/60 =) 12.8 (g) 0.4(0) × 12.8 5.12 (g of nylon)	M1 m1 A1 B1 M1 A1 6	*OR (60cm is 80p,1cm is) 80/60 (=1.3(33…p)* *OR 96cm costs 80 + 36×80÷60* CAO If units are given they must be correct FT their '×1.6', FT their derived 12.8g CAO *If no marks, SC1 for (0.4×8 =) 3.2(g)*
5. Herenow Bank 20000×1.022^{12} (£) 25 968.13 Denford Building Society 20000×1.027^{10} (£) 26 105.645.. Conclusion, e.g. 'Denford, with still 2 further years to invest somewhere', 'Denford is more (with time to make more interest too)'	 M2 A1 M2 A1 E1 7	*Penalise working with Dreadly Bank -1, unless rejected* M1 for sight of 1.022^{12} or for 20000×1.022 M1 for sight of 1.027^{10} or for 20000×1.027 FT provided at least M2 awarded Ignore an incorrect statement provided a valid reason is given *Alternative: comparison of 1.022^{12} = 1.298% and 1.027^{10} = 1.305% is awarded B4, then E1 for conclusion "Denford, as more interest in less time' or similar*
6(a)(i) Strategy, **use of** suitable linear type relationship, e.g. Mountain biking burns 502÷130 or 598÷155 or 695÷180 (=3.86 calories/pound), OR Review of differences or gaps 180 – 155 = 25 pounds AND 695 – 598 = 97 calories Method of estimating, e.g. 170 × 3.86 calories/pound OR 97 ×15/25 + 598 Accept answers in the inclusive range 653 to 663 (ii) Weighs (75 × 2.2 =) 165 pounds Suitable method to estimate, e.g. weight × 1.8(1.. calories/ pound per h) (× 4½) OR 281 + 10/25×(327 – 281) (×4½) ×4½ From suitable calculations, answers in the inclusive range 1336 to 1350 (calories)	S1 M1 A1 B1 M1 m1 A1 7	Quotients need to be appropriate for use, not inverted Accept equivalent methods, e.g. setting up linear equations or unitary ratios Example: 695 ×170/180 (=0.944…) is S1, M1 Only accept answers in this range FT 'their 165 pounds' Accept equivalent methods with linear equations or unitary ratios Accept as complete method for 1 hour. Allow use of weight as '75' for M1 only Allow FT answers from similar premature approximation
6(b) Set up any one suitable equation, e.g. ⅓ x + ¼ y = 12 OR ½ x + ¾ y = 30 Two suitable equations with consistent units of time, e.g. ⅓ x + ¼ y = 12 AND ½ x + ¾ y = 30, OR 20x + 30y = 720 AND 30x + 45y = 1800 Full method to solve, e.g. equate coefficients and decision to subtract First variable correct Method to calculate second variable Second variable correct	S1 B1 M1 A1 m1 A1 6	Allow with mixed units of time, e.g. 20 x + ¼ y = 12 OR ½ x + 45y = 30 Allow 20x + 15y = 12 AND 30x + 45y = 30 FT provided at least one equation is correct (in hours or minutes consistently) and equivalent difficulty Allow 1 error in a value other than the equal coefficient Penalise once only as km/min* (Penalise once only as km/min*) **Penalise once only for answers given as km/min,* *x = 0.2 (km/min), y = 0.533… (km/min)* **x = 12 (km/h), y = 32 (km/h)**

Applications Unit 2 Higher Tier January 2016		Final
7(a) Working towards unitary ratio, e.g. 1000kg is equivalent to 4320÷5.4 (=800 litres), or 1kg is equivalent to 4320÷5400 (=0.8 litres)	M1	Place value may be incorrect Allow inverted quotients, but must be used correctly for m marks
3.2 is 3200kg AND 3200 ×4320÷5400 or 5120 ÷ 0.8 or equivalent	m2	Full method that could lead to a correct answer m1 for digits of calculations correct with place value error m1 or m2 also implies initial M1
3200(kg) AND 2560 (litres)	A1	
Use of 5120 = 2×2560 OR 5120×5400÷4320 OR equivalent	M1	FT 'their 2560'
6.4 AND 6400(kg)	A1	
(b)(i) <u>Plane 5 gallons of fuel per mile</u> (1 gallon =) 1 ÷5 (miles per gallon) ×550 (person miles per gallon) Plane: total distance travelled = 110 (person miles per gallon)	 M1 M1 A1	*Alternative reverse calculations:* *Car (per person) 25 mpg is equivalent to 1 mile using (1/25=) 0.04 (gallons) M1* *Plane (per person) 1 mile uses 5/550 M1* *= 0.00909.. (gallons per person) A1* *(accept 0.01 from correct working)*
Implies Carlo is correct by appropriate comparison, e.g. 'Yes, as per person, car is 25mpg, plane is 110 mpg	A1	*OR e.g. 'Yes, as per person per mile, car is 0.04 gallons but plane is (only) 0.009090… gallons A1* *Alternative:* *(200 miles with 8 gallons in car)* *200 miles is 1000 gallons in plane M1* *1000÷550 M1* *= 1.8(1.. gallons per person by air) A1* *Implies Carlo is correct by comparison 8 to 1.8(1..) gallons per person A1* *Alternative:* *(200 miles with 8 gallons in car)* *200 miles is 1000 gallons in plane M1* *550 people by car would be 8 × 550 M1* *= 4400 (gallons) A1* *Implies Carlo is correct by comparing 550 people, 1000 to 4400 gallons A1*
(b)(ii) Suitable explanation, e.g. 'not true if the plane isn't filled', 'could be a big difference between aviation and car fuel prices', 'car travel economy improves when more than one person'	E1 11	Accept reference to more expensive cost for domestic, or short haul flights.

Applications Unit 2 Higher Tier January 2016		Final
8(a) $y \geq 5$ AND $y < 2x$ AND $80x + 120y < 2400$	B4	B3 for any 2 correct inequalities B2 for any 1 correct inequality with at least one other inequality only inaccurate due to incorrect symbol ($>, \geq, <, \leq$) B1 for any 1 correct inequality, **or** B1 for at least two inequalities only inaccurate due to incorrect symbol ($>, \geq, <, \leq$)
(b) Line $y = 5$ drawn correctly	B1	FT their inequalities if possible
Line $y = 2x$ drawn correctly	B1	
Line $80x + 120y = 2400$ drawn correctly	B1	
The correct region indicated	B1	CAO
(c) 8 statues and 14 paintings $(8\times80 + 14\times120 = 640 + 1680)$	B1	FT their graph provided at least B2 in (b) Independent of their graph, may be from calculation. Allow correct response from incorrect graph
(£)2320	B1	Allow 2320 alone, without the number of paintings and statues i.e. B0, B1 *Allow SC1 for 9 statues with 14 paintings **and** £2400 cost OR* *Allow SC1 for 7 statues with 14 paintings **and** £2240 cost*
	10	
9(a) $(n =)\ 3^4$	M1	
81 (tomatoes)	A1	
(b) 10.8 kg is $(10.8\times1000\div50 =)$ 216 tomatoes left	B1	
Number of kg tomatoes sold (£)51.90 ÷ (£)1.50 (=34.6 kg)	M1	
Number of tomatoes sold ×1000 ÷ 50	m1	
692 (tomatoes)	A1	
Total number of tomatoes (216+692=) 908	B1	FT their 692 provided at least M1 awarded *Alternative:* *Mass of tomatoes sold 51.90÷1.50 (=34.6kg) M1* *Total mass of tomatoes taken to market* *34.6 + 10.8 or 51.90÷1.50 +10.8 m1* *= 45.4 kg A1* *Number of tomatoes taken to market* *45.4 ×1000 ÷ 50 0R 45.4 × 0.05 M1* *= 908 A1*
$908 = 3^d$	B1	FT their 908, provided at least 3 marks previously awarded
Method to solve, e.g. trial & improvement or attempt the graph of $n = 3^d$	M1	
Appropriate graph plotted between d = 6 and d = 7, or trial for d = 6 and d = 7 (729 and 2187)	m1	
6.2 (hours of continuous sunshine)	A1	
	11	
10. Volume of cup = $2\times\pi\times4.2^3\div3$ or equivalent	M1	Do not accept with sight of ‘r=8.4’
155 (cm^3) or 49.392π (cm^3)	A1	Values rounding to 155, e.g. 155.1.. or 155.2… Award this A1 as implied by correct sight of equating volumes with intention to cancel π
Volume jar $155 = \pi\times r^2\times5.2$ or $49.392\pi = \pi\times r^2\times5.2$	M1	FT their volume equated to $\pi\times r^2\times5.2$
$r^2 = 9.498\ldots$ or $r = 3.08\ldots$	A1	
Diameter of the jar 6.2 (cm)	A1	CAO. Must be 1dp
	5	