GCSE MARKING SCHEME

JANUARY 2016

APPLICATIONS OF MATHEMATICS
UNIT 1 - HIGHER TIER
4361/02

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 1 - HIGHER TIER

MARK SCHEME – JANUARY 2016

Applications Unit 1 Higher Tier January 2016		Final
1. w = 74° x = 68° y = 142° z = 74°	B1 B1 B1 B1 4	 FT 142 – their w FT their w + their x FT their w
2.(a) 09:00 to 09:35 or 09:40, 09:40 to 10:15 or 10:20, 10:20 to 10:55 or 10:20 to 11:00 OR, Attempt 120 minutes ÷ 35 minutes or ÷40 minutes, OR equivalent towards finding 3 production runs (3×4 =) **12** (soup spoons)	B1 B1	Working may be shown in stages
(b) 7 × 252 ÷ 21 OR ⅓ × 252 **84** (knives)	M1 A1	OR sight of '12 production runs'
(c) Forks 6, 12, 18, 24, AND Soup spoons 4, 8, 12, 16 WITH sight of comparison of difference in numbers for each run, OR Trial & improvement, e.g. 20×6 compared with 20×4 and consider the difference **26** (production runs)	M1 A1 6	OR sight of 156 and 104, OR sight of 52 ÷ 2 (as 2 more soup spoons in each run)
3(a) Correct scale used with diagonals 6 cm and 10 cm Longer diagonal split 4 cm and 6 cm at intersection Shorter diagonal split 3 cm and 3 cm Diagonal intersection 90° (±2°) Outline of the kite correct	B1 B1 B1 B1 B1	 FT their consistent scale if possible FT their kite for an equal split of the shorter diagonal, a kite must be seen May not be shown, implied provided kite outline seen CAO, not FT *Diagonals given treated as sides, award:* *B1 if scale of sides is correct,* *B0* *B1 if their kite has an equal split of the shorter diagonal,* *B0,* *B0*
(b) Both obtuse angles AND Head and tail angles correctly measured, ±2°	B2 7	FT their quadrilateral B1 for any 2 or 3 angles correctly measured, ±2° (Approximately 74°, 53°, 117°, 117°, but measure their angles) There is no requirement for their angle sum to be 360°
4(a) Area triangle = ½ × 8 × 3 or 2 × ½ × 4 × 3 Total area = 9×8 + ½×8×3 (= 72 + 12) or equivalent 84 (cm^2)	B1 M1 A1	OR an appropriate non rectangular area FT their 'area triangle' CAO
(b) Perimeter floor = 8 + 6 + 8 + 6 or equivalent 28 (cm)	M1 A1	
(c) Vertical side area = 9 × 6 OR Roof piece area = 5 × 6 54 (cm^2) 30 (cm^2)	M1 A1 A1 8	

Applications Unit 1 Higher Tier January 2016		Final
5(a) Perpendicular bisector (±2°) between Shrewsbury and Hereford Aberystwyth and Newtown Helicopter base indicated	 B1 B1 B1	 *Arcs must be shown* *Arcs must be shown* Accept sight of the intersections of the perpendicular bisectors FT provided B1 previously awarded and the other perpendicular bisector is within ±4° tolerance *If B0, B0 due to no arcs, allow FT for possible final B1 provided perpendicular bisectors used* Accept the intersection of the two perpendicular bisectors as their indication. FT provided at least one line accurate but the other slightly outside the tolerance, ±4°
(b) 62 miles (±5 miles) AND 325 ° (±2°) 70 miles (±5 miles) AND 225 ° (±2°)	B2 B2 7	B1 for each answer B1 for each answer *If neither B1 given for bearings then allow SC1 for bearings meeting ±4° tolerance*
5(c)(i) F = fx (ii) (T =) fx + c + b + n or (T =) F + c + b + n	B2 B1	Accept F = f×x. B1 for sight of fx FT their 'fx'
(d) Use of Haverfordwest to Hereford ≥120 but <125 miles	S1	
Method to calculate cost of flying ≥100 miles, OR calculate number of miles possible with £600 fuel	M1	e.g. 100 miles costs: 4×30×8.25 (=£990) e.g. Number of gallons is 600÷8.25 (=72.72… gallons) AND comparison with 30 gallons for flying 25 miles
All necessary calculations or approximations reasonable, e.g. **'£990** of fuel for 100 miles calculated correctly', '£1089 fuel for 110 miles', or '72.72.. gallons (rounded or truncated) ÷ 30 is 2.42.. multiples of 25 miles, **60.6 miles** worth of fuel'	A1	
Conclusion: 'Insufficient fuel'	E1	Depends on M1 and appropriate interpretation of their working provided their distance ≥100 miles
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	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.

Applications Unit 1 Higher Tier January 2016		Final
6(a) 16/40 or equivalent ISW	B2	B1 for either 16/ … or …/40
(b) Chicken AND conclusion, e.g. 'Reduce Chicken, yes more money because people will buy more', or 'Chicken, she will not take more as same number of sandwiches might be sold, less takings'	E1	
(c) 7 : 8 : 5	B2	B1 for sight of 14:16:10, sight of 7, 8 and 5 in order
(d) 7 × 220 ÷ (7+8+5) or 220 × 14/40 or equivalent 77 (salmon sandwiches)	M1 A1	FT from their ratio for M1 only
(e) Implies first hour and /or Monday morning may not be typical	E1	Must be the flaw in the current strategy
Strategy to improve, e.g. 'need to collect more data', 'need to make the list for more than the first hour'	E1	Must be a way to improve the strategy
	9	
7(a) Use of πd or equivalent for <u>either</u> wheel, sight of π×64 or π×210	M1	
Circumference of <u>both</u> wheels 200.96 to 201.14… (m) <u>and</u> 659 to 660 (m)	A1	
Circumference of either wheel with division by 15 <u>or</u> 36 appropriately	m1	FT their circumference provided M1 awarded
Gaps on circumference 13.39 to 13.41 (m) **and** 18.3 to 18⅓ (m)	A2	A1 for either answer. FT from M1, m1 previously awarded
Conclusion: • Implies Wiener pods closer together • By approximately 5 metres	A1 A1	FT from M1, m1 previously awarded FT from M1, m1 previously awarded Accept equivalent comparison, e.g. as a percentage *Allow alternative using trigonometry (not content):* *Use of 360°÷number of pods for <u>either</u> wheel, sight of 360÷15 or 360÷36* *B1* *(Use of right-angled triangle with angle 12° <u>or</u> 5°, OR cosine rule with angle 24° <u>or</u> 10°, e.g.) sin12°=½gapW/32 <u>or</u> sin5°=½gapD/105 <u>or</u> equivalent correct substitution into cosine rule* *M1* *½gapW =32×sin12° <u>and</u> ½gapD=105×sin5°, or* *equivalent (gap)^2 from cosine rule* *m1(also implies previous M1)* *½gapW =6.653..(m) <u>and</u> ½gapD=9.1513 (m)* *A1* *then as main mark scheme:* *Gaps on circumference* *13.3(m) <u>and</u> 18.3(m)* *A1* *Conclusion:* *Implies Wiener pods closer together* *A1* *By approximately 5 metres* *A1* *If no marks, then SC2 for 'Dubai wheel has circumference (210/64 =) 3.28 times as big as the Wiener wheel, therefore would expect over 3 times as many pods, therefore Wiener pods closer together'*
(b) 24 (million)	B2	B1 for sight of 108 million or 84 million, or evidence of method $1.08\times10^8 - 8.4\times10^7$, or 24000000, 2.4×10^7 or equivalent
	9	

Applications Unit 1 Higher Tier January 2016		Final
8(a) Method to find area 3000×1+500×3+500×3.5+500×2.5+500×2+2000×0.5 9500 (chilli peppers) (b) Mean: mid points 2000, 3250, 3750, 4250, 4750, 6000 2000×1500+3250×3000+3750×5500+ 4250×7000+4750×2500+6000×500 (78 000 000) ÷20000 3900 (Scoville Heat Units) Median: 20000(chilli peppers) with idea to find mid value hotness 4000 (Scoville Heat Units)	M1 m1 A1 B1 M1 m1 A1 M1 A1 9	Any one area correct (3000 + 1500 + 1750 + 1250 + 1000 + 1000) Allow for sight of any 4 correct products in a sum of 6 CAO FT their mid points provided at least 5 are within appropriate intervals, including bounds FT their sum of products divided by 20000 CAO Allow for sight of 20000÷2 or 10000 (including as a final answer) FT 'their 20000' provided ≠ 6
8(c)(i) (23000+31000+9000)÷3 21000, 16000, 7100, 7100 (ii) 8000×3 -4300 – 9000 10700 (chilli peppers)	M1 A2 M1 m1 A1 6	Or any other sum of 3 consecutive values with intention to divide by 3 A1 for any one correct answer *Alternative(x + 4300 + 9000)÷3 = 8000 M1* *Trial value for x OR 8000×3 -4300-9000 m1* *10700 (chilli peppers) A1*
9(a) (20,) after 1st bounce 10m, after 2nd bounce 5m, after 3rd bounce 2.5m, after 4th bounce 1.25m (b) 20 + 10 + 10 + 5 + 5 + 2.5 + 2.5 + 1.25 + 1.25 57.5 (metres) (c) Axes with uniform scale, 0 to at least 10m and hits 1 to 8 Axes labelled appropriately Points plotted 10, 5, 2.5, 1.25, 0.625, 0.3125, 0.15625, 0.078125 (metres) (d) After 1st hit h/2, after 2nd hit h/2² or h/4, … After *n* hits M= h/2ⁿ	M1 A1 M2 A1 B1 B1 B1 M1 A2 11	Evidence of repeat halving, at least twice M1 for the sum of halved distances showing 20 once plus at least one other distance twice, CAO *SC1 for answers of 77.5(m) or 38.75(m) from working with all distances twice or once respectively* Intention, as appropriate for graph paper *Ignore joining points* A1 for sight of h/2ⁿ. also implies M mark *If no marks, award SC1 for sight of M = (h/2)ⁿ*

Applications Unit 1 Higher Tier January 2016		Final
10(a) (25) ÷ 60 ÷ 60	M1	
× 1000	M1	
6.9(44… m/s)	A1	
Reading from graph 59 to 60 (seconds)	B1	FT from their 6.9 provided at least 1 M mark previously awarded
(b) Tangent at t = 70	M1	
Use of difference in v / difference in t	M1	Accept with or without sight of a tangent
Acceleration …… (reasonable for their tangent)	A1	Must be evaluated from their tangent
m/s^2 or ms^{-2}	U1	Independent mark
(c) Use of area under the curve from 0 to 80 seconds	S1	*Treat area 0 to 100 seconds as MR-1 then FT*
Correct method, including ½×11×80, or 20 + 56 + 106 + 180	M1	Accept any suitable calculation for 1 or more blocks of area
Correct answer to calculation, e.g. 440(m) or 362(m)	A1	Allow suitable estimates for the vertical scale values
(d) Attempt to find at least one point, i.e. value of v for a value of $0 < t \leq 100$	S1	
At least 2 correct plots or 2 appropriate values of v	P1	
Suitable curve between 80 and 100 or 3 values of v evaluated in the interval $80 \leq t \leq 100$	C1	
(t) 82 or 83 seconds (to the nearest second)	B1	*Allow B4 for a correct answer resulting from a substitution or trial method*
	15	

t	20	40	60	80	100
v	4.48	5.92	8.32	11.68	16