wjec cbac

GCSE MARKING SCHEME

SUMMER 2016

GCSE MATHEMATICS LINKED PAIR METHODS UNIT 2 HIGHER 4364-02

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.

METHODS IN MATHEMATICS UNIT 2 (HIGHER TIER) - SUMMER 2016

Methods in Mathematics		Commente
Unit 2 Higher Tier		Comments
1. Shape completed accurately with correct rotation seen	B3	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, of a correct rotation of the part of the shape given ignore other 00°
	3	rotations shown
2(a) 3x + x OR 4x (cm)	B1	Mark final answer
(b) $(x =)$ 40	B2	FT for $8x + $ 'their FE' = 480
		B1 for sight of $12x = 480$ or equivalent informal notation
	3	
3(a) $100 \times 45/9000$ or $100 \times 45 \div 9000$	M1	
$0.5(\%) \text{ or } \frac{1}{2}(\%)$	Al	
(b) 1.015×4000 or $4000 + 4000 \times 1.5/100$	MI	Accept 0.5 written as ¹ / ₂
4060	A1	CAO
(c) 0.28×1350 or 5/8×580 or 0.084×4450 or equivalent	M1	Any one correct calculation shown
378 (m)	A1	Accept to 2 sig. figs. 380
362.5 (m)	A1	Accept 362(.5) or 363 or to 2 sig. figs. 360
373.8 (m)	A1	Accept 373(.8) or 374 or to 2 sig. figs. 370
260, 270, 280	D1	Ignore any further working for M and A marks
500 570 580	DI	FT provided at least 2 of the A marks awarded
		11 provided at least 2 of the A marks awarded
(d) 10 – 9	M1	
= 1	A1	If no marks, award SC1 for sight of $9.999 - 9 = 0.999$
		or 0.9 recurring
	11	
4. (a) (r_{1}) 12: $\frac{9}{2}$	MI	Accept embedded answers in parts (a), (b) & (c)
(a) $(X =) 12 \times 8/3$		
(b) $(x =) 8$	B1	Mark final answer. Do not accept 72/9
(c) $35x - 65 = 40$ OR $7x - 13 = 40/5$	B1	FT until 2 nd error
35x = 105 or x = 105/35 $7x = 21 or x = 21/7$	B1	
x=3	B1	Accept an embedded answer for B3
(d) $6x < 100 - 4$ or $6x < 96$ or $3x < 50 - 2$ or $3x < 48$	M1	No marks for use of "=", unless finally replaced to give
x< 16	A1	x < 16 then award M1 A1.
()		SCI for $X < 104/6$ ISW On eight of $2\sqrt{26} = 78$ with $2\sqrt{27} = 81$ or equivalent
(e) $X < 81/3$ or $X < 2/$ or $/8 < 81$	M1	divisions $3 \times 20 = 78$ with $3 \times 27 = 81$ of equivalent
(x =) 26	Δ1	Accept unsupported 26, or a unique answer of 26 from a
	711	trial and improvement method, or $3 \times 26 < 81$
		Do not accept x<26.
		Allow sight of $3x = 81$, $x = 27$ followed by selecting
		x = 26
	10	
5. $24\pi = 2\pi r$ or $24\pi = \pi d$ or $d = 24(cm)$	M1	D_{2} and c_{2} and $110(0)$
r = 12 (cm)		Do not accept 11.9(9)
6. $(x^2 =) 6.8^2 + 8.4^2$	 M1	
$(v^2 =) 9.3^2 - 6.8^2$	M1	
$x^{2} = 116.8 \text{ or } (x=) \sqrt{116.8} \text{ OR } y^{2} = 40.25 \text{ or } (y=)\sqrt{40.25}$	A1	
x = 10.8(07)	A1	Accept 11 from correct working
y = 6.3(44)	A1	Accept 6 from correct working
	5	

Methods in Mathematics Unit 2 Higher Tier		Comments
7.(a) Correct rotation	B2	B1 near miss of grid lines, or for anticlockwise 90° about (2, 0), or for clockwise 90° about (0, 2)
(b) Correct reflection in $y = x$	B2	B1 for sight of the line $y = x$ or correct reflection in $y = -x$
(c) Enlargement scale factor ¹ / ₂ with correct orientation	B2	B1 for any 1 line correct, or consistent incorrect fractional scale <1, or enlargement scale factor ¹ / ₂ with incorrect orientation
Correct position	B1 7	Not FT. Use bottom right hand vertex as a guide
8. (base edge ²) 576.6 ÷ 15 (=38.44) (base edge) $\sqrt{(576.6 \div 15)}$ (=6.2 cm) (new base edge) $\sqrt{(576.6 \div 15)} \times 6/5$ or equivalent 7.44(cm)	M1 m1 m1 A1	FT 'their 6.2' that is 'their base edge' CAO
(New volume) $7.44 \times 7.44 \times 15$ (=830.304 cm ³) (Difference volume) $830.304 - 576.6$ (=253.704 cm ³)	B1 B1	FT their 7.44 provided M1, m2 previously awarded FT their new volume provided M1 previously awarded and attempt 'their 7.44' × 'their 7.44' × 'their 15' May be implied in further working
(Percentage increase is) $\frac{253.704}{576.6}$ (× 100) or 1(×100) - $\frac{830.304}{576.6}$ (× 100)	M1	FT provided their difference in volumes correctly evaluated or implied in an equivalent method
44(%)	A1	('their 15' as 18 gives an answer of 72.8(%) or 73(%)) Alternative: Linear scale factor 1.2 or equivalent M2 Volume scale factor 1.2^2 m3 -1.44 A2
		Percentage increase 44(%) A1
		Other alternatives are accepted, such as new volume as % original subtract 100, or comparison of base areas
QWC2: Candidates will be expected to • present work clearly, with words explaining start, process or steps	Q W C 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.
• make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer		QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar OR
 QWC1: Candidates will be expected to present work clearly, with words explaining start, process or steps 		evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar.
 OR make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer 	10	QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.
9(a) $x = 14.3 \times \sin 35^{\circ}$ x = 8.2(02cm)	M2 A1	M1 for $sin35^\circ = x/14.3$ Accept 8(cm) from correct working
(b) $\tan y = 14.6/8.7$ $y = \tan^{-1} 14.6/8.7$ or $\tan y = 1.678$ $y = 59(.2^{\circ})$	M1 A1 A1 6	Allow for sight of tany = 1.67 or 1.68

Methods in Mathematics		Comments
Unit 2 Higher Tier		
10. $(+\pounds)$ 32 AND $(+)$ 4.3(%)	B2	B1 for (32 and) 32/750 or sight of 4.2(666%)
(£) 900	B2	B1 for interpretation '1(.)09 is 981', e.g. 981÷1(.)09
(+£) 100 AND (+) 12.5(%)	B1	CAO
(£) 81	B1	CAO
	6	2
11. 1.23×10^2	B3	B2 for $1.2(29) \times 10^2$ or 123
	3	B1 for 122.903
12. $x = 2.6 \times 4.6 \div 3.2$	M2	M1 for $3.2/4.6 = 2.6/x$ or equivalent
		Award M2, A0 for an answer of 3.8(3cm) from
		$4.6 \div 1.2$
3.7(375 cm)	A1	Accept 4(cm) from appropriate working.
		No marks for unsupported 4(cm)
	3	
13(a) $3 \times 13.6 \div 8.5$ or 3×1.6 or equivalent	M1	
4.8 (cm)	A1	
(b) Volume scale factor 1.6^3 or 0.625^3 or unsimplified	B1	FT 'their derived 1.6^{3} '
equivalents		
Volume smaller box 102.4×0.625^3 or $102.4 \div 1.6^3$	M1	
$25 \text{ (cm}^3)$	A1	
	5	
14. $y = 7 - x$ OR $x = 7 - y$	M1	OR For sight of $x^2 + xy = 7x$ (2 nd eqn multiplied by x)
$2x^{2} + x(7-x) + 6 (=0)$ $2(7-y)^{2} + (7-y)y + 6 (=0)$	M1	OR Subtraction from 1 st equation
$x^{2} + 7x + 6 = 0$ $y^{2} - 21y + 104 = 0$	A1	OR $x^2 + 7x = -6$ or equivalent
(x + 1)(x+6) (= 0) $(y - 8)(y - 13)$ (= 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 = -6 OR $y = 8, y = 13$	A1	
y = 8, y = 13 $x = -1, x = -6$	A1	
		If A0, A0 then SC1 for $x = -1$, $y = 8 OR x = -6$, $y = 13$
		provided algebraic method shown with appropriate M1,
		M1, M1 marks
	6	No marks for trial & improvement methods
15. $y \alpha 1/x^2$ OR $y = k/x^2$	B1	Ignore use of incorrect symbol 'α' later
$10 = k/6^2$	M1	FT y α 1/x or y α x ²
$y = 360/x^2$ or $k = 360$	A1	
$x^2 = 360/4$ or $x = (\pm)\sqrt{90}$ or $x = 9.4868$	M1	FT 'their k' provided at least 1 mark previously awarded
$x = \pm 9.4868 \text{ or } \pm 3\sqrt{10}$	A1	Accept rounded or truncated, but MUST be \pm .
		No FT from 1/x as both solutions required
	5	
16. Sight of $BA = 2.8(cm)$ and $AO = 5.6(cm)$	B1	
Outer arc $2 \times \pi \times 8.4 \times 131/360$	M1	
Inner arc $2 \times \pi \times 5.6 \times 131/360$	M1	FT 'their 5.6' provided <8.4, \neq 4.2 and >2.8
Outer arc 19.2(cm) AND Inner arc 12.8(cm)	A1	CAO
		If M0, M0, A0 allow:
		SC2 for 9.6(cm) with 6.4(cm), or
		SC1 for sight of $v \times \pi \times 131/360$, where v is a value >0
Perimeter $2.8+2.8+$ outer arc + inner arc	M1	FT 'their 2.8' provided <4.2. FT their outer and inner
		arcs provided derived from dimensionally correct
		formulae
37.6 (cm)	A1	CAO
		Alternative:
		use of mean arc, using mean radius 7cm twice – must be
		convincing, then B1 mean radius, M2, A1 for mean arc
		used twice, then M1, A1 for perimeter
	6	

Methods in Mathematics Unit 2 Higher Tier		Comments
17. $EG^2 = 7.8^2 + 5.5^2 - 2 \times 7.8 \times 5.5 \times \cos 136^\circ$	M1	or $EG^2 = 152.809$ or $EG = \sqrt{152.809}$
EG = 12.36(cm)	A1	
$\sin F = \frac{\sin 51^{\circ} \times 12.36}{11.4}$	M2	FT 'their derived EG' provided M1 awarded M1 for $\underline{\sin F} = \underline{\sin 51}^{\circ}$ or $\underline{12.36} = \underline{11.4}$ 12.36 $\underline{11.4}$ $\underline{\sin F} = \underline{\sin 51}^{\circ}$
$F = 57.4^{\circ} AND$	A1	EG=12cm gives 54.88°
sight or use of $E = 180^{\circ} - 51^{\circ} - F$ (=71.57°)		EG=12.3cm gives 56.98° EG=12.4cm gives 57.7°
Area EFG OR Area EHG = $\frac{1}{2} \times 11.4 \times 12.36 \times \sin 71.6^{\circ}$ = $\frac{1}{2} \times 7.8 \times 5.5 \times \sin 136^{\circ}$	M1	FT 'their EG' provided at least M2 previously awarded FT their correct evaluation of angle E from their angle F provided $<90^{\circ}$ and at least M2 previously awarded (E = 71.6°)
$= 66.85(\dots cm^2)$	A1	$(E=72^\circ, EG=12.4cm \text{ gives } 67(.22cm^2))$
$= 14.9(cm^2)$	A1	Accept 15(cm ²)
Area EFGH 81.7(49 cm ²) or 82(cm ²)	A1	Accept other rounding, unrounded or truncated answers. FT provided at least one of the areas EFG or EHG is correct AND all M marks awarded
	9	

GCSE Methods in Mathematics Unit 2 Higher Tier MS Summer 2016