GCSE MARKING SCHEME

SUMMER 2016

GCSE MATHEMATICS UNITISED UNIT 3
HIGHER TIER

4353/02

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 Mathematics - Unitised Unit 3 Higher Tier
Summer 2016 Mark Scheme

Summer 2016 Unitised Unit 3 Higher Tier	✓	Mark	Comments
1. *(a)* $2(4x + 3y)$		B1	
1. *(b)* 3·66		B2	B1 for 3·6(5930571) or 3·7
2. **Use Overlay.** Sight of 60(°) or use of a 60° angle. Suitable arc(s) drawn for 60° angle. One complete sector. Completed diagram.		 B1 M1 A1 A1	 Allow ±2°.
3. *(a)* All points plotted correctly.		B2	B1 for 3, 4 or 5 points plotted correctly, not joined, OR B1 for all points plotted correctly but joined.
3. *(b)* Positive.		B1	
3. *(c)* Valid reason e.g. "The 60-mile ride could have been over flat roads whereas the 52-mile ride could have been uphill.", or "The wind could have helped on the 60-mile ride.", or "The cyclist may have ridden more slowly on the 60-mile ride", or "The weather was hotter on the 52-mile ride".		E1	
4. Method of trial and improvement. Two 3kg bags and three 8kg bags.		M1 A1	e.g. $1 \times 3kg + 2 \times 8kg = 19kg$ $19 \div 3 \neq 6$. $2 \times 3kg + 1 \times 8kg = 14kg$. $14 \div 3 \neq 6$. $2 \times 3kg + 3 \times 8kg = 30kg$. $30 \div 5 = 6$. If no marks awarded, SC1 for 2n (3kg) and 3n (8kg) for $n \geq 2$.
5. **Ribbon marked.** *(a)* A line from (9am, 0) to (11:12am, 110). Horizontal line, joining the end of the 1st line with (12pm, 110). A line from the end of the horizontal line to (3pm, 240)		 B1 B1 B1	 Doesn't have to be a straight line. FT from their 1st line. FT from the end of their 2nd line. Doesn't have to be a straight line.
5. **To be viewed with graph.** *(b)* 240/6 = 40 (mph)		 M1 A1	 FT their d-t graph provided at least B1 awarded in (a).
6. *(a)* $x + 5 = 18$ OR $x/6 = 13/6$ $x = 13$		B1 B1	FT until 2nd error. Accept embedded answers.
6. *(b)* $10x - 15 - 8x = 10$ $10x - 8x = 10 + 15$ $x = 25/2$ or 12·5		B1 B1 B1	FT until 2nd error.
7. **Ribbon marked** *(a)***To be viewed with diagram.** (Area of rectangle =) 8×15=120 OR 8×4=32 (cm^2) (Area of triangle =) (12×11)÷2 OR (Area of trapezium =) 0·5(8+20)×11 = 66 (cm^2) OR 154 (cm^2) (Total area =) 186 (cm^2) QWC: Look for • correct units used i.e. cm^2 • spelling in at least 1 statement/sentence • clarity of text explanations QWC2: Candidates will be expected to • present work clearly, with words or quantities shown for clarity of 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 or quantities shown for clarity of process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer	 ✓ ✓ ✓ ✓ ✓ ✓	 B1 M1 A1 B1 QWC 2	 If 2 rectangles are formed their total area needs to add to 120. FT provided first B1 awarded, and a correct formula used for the area of a triangle or trapezium. QWC2 Presents 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.

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7. *(b)* 186 × 200	✓	M1	FT 'their 186' × 200.
= 37 200 (cm^3)	✓	A1	
108 000 ÷ 37 200	✓	M1	FT 108 000 ÷'their derived 37 200'.
= 2·9(032…) (g/cm^3)	✓	A1	
			If no marks awarded, SC1 for 'their mass' ÷ 'their volume'.
8. *(a)* Volume of lime = (4/5 × 200 =) 160		B1	
Volume of cranberry = (4/5 × 300 =) 240		B1	
160:240:400 or 2:3:5 or equivalent.		B1	FT 'their 160' and 'their 240' provided they add to 'their lemonade' and 'their lime' ≤ 'their cranberry' Correct answer implies all 3 marks.
8. *(b)* (1 part =) (£)84.80 ÷ 8 (=£10.6(0))		M1	
(£)53 AND (£)31.8(0)		A1	
9. 360 ÷ 24 OR equivalent work involving the internal angle.		M1	
= 15 (sides)		A1	
10. *(a)* Points plotted at mid-points of groups and straight lines connecting the points.		B2	B1 for at least 4 points plotted and joined correctly, OR for all points plotted correctly but not joined. Accept intention of straight lines. Ignore any lines outside the first and last points.
10. **To be viewed with frequency table.**			
(b) 30 ≤ x < 40		B1	
11. (*BD* =) 40 ÷ tan51(°)	✓	M2	M1 for tan51(°) = 40 ÷ *BD*.
	✓		
(*BD* =) 32(·391…) (m)	✓	A1	
(*CD* =) =12(·391…) (m)	✓	A1	FT 'their 32(·391…)' – 20 provided at least M1 awarded and their 32(·391…) >20. If no marks awarded, SC2 for (incorrect placement of the 51° in the diagram leading to) a correct evaluation of tan51(°) × 40 – 20 (29(·395…)) SC1 for (incorrect placement of the 51° in the diagram leading to) tan51(°) × 40
12. **Ribbon marked. To be viewed with diagram.**			
(a) 5 × (4·4 ÷ 2) or 5 ÷ (2 ÷ 4·4) or equivalent		M1	
= 11 (cm)		A1	
12. *(b)* 6 ÷ (4·4 ÷ 2) or 6 × (2 ÷ 4·4) or equivalent		M1	FT their scale factor from *(a)*.
= 2·7(2727….) (cm)		A1	
13. *(a)* **To be viewed with diagram. Ribbon marked.**			
Correct statement of Pythagoras' theorem.			
e.g. $(2x + 1)^2 = (x + 6)^2 + (x – 1)^2$	✓	M1	
Sight of one correct expansion			
$4x^2 + 4x + 1$ OR $x^2 + 12x + 36$ OR $x^2 – 2x + 1$	✓	B1	
$4x^2 + 4x + 1 = (x^2 + 12x + 36) + (x^2 – 2x + 1)$	✓	A1	
$2x^2 – 6x – 36 = 0$ leading to $x^2 – 3x – 18 = 0$	✓	A1	
13. *(b)* $(x – 6)(x + 3)$	✓	B2	B1 for $(x…6)(x…3)$.
	✓		
$x = 6$ (AND $x = −3$)	✓	B1	FT from B1.
AB = 12, AC = 13, BC = 5	✓	B1	CAO.
14. 80 × 90 × 365 × 24 OR 80 × 90 × 52 × 7 × 24	✓	B1	
= 63 072 000 OR 62 899 200	✓	B1	Or their equivalents but not in standard form.
= $6·3 × 10^7$	✓	B1	FT their answer provided of equivalent difficulty.
15. **Ribbon marked. To be viewed with graph.**			
(a) 46·8 (seconds)		B1	
15. *(b)* 12 (players)		B1	
16. **Ribbon marked. To be viewed with graph.**			
(a) 6		B1	
16. *(b)* Plotting at least 4 points correctly.		P1	FT 'their 6'.
Plotting all 6 points correctly connected with a curve.		C1	
16. *(c)* y = − x + 1 drawn		M2	M1 for a straight line with either a correct gradient, OR for a straight line with a correct intercept and a gradient < 0.
(x =) −1·3 AND 2·3		A1	FT their curve and their straight line, provided at least M1 awarded AND there are 2 solutions.
17. $x = \frac{10 \pm \sqrt{(-10)^2 - 4 \times 5 \times 3}}{2 \times 5}$		M1	Allow 1 slip in substitution.
$x = \frac{10 \pm \sqrt{40}}{10}$		A1	CAO.
$x = 1·63$, $x = 0·37$		A1	CAO. Both answers must be given.

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18. **Ribbon marked.** *(a)* $y = k \div x^3$ OR $y \propto 1/x^3$ $2 = k \div 2^3$ or $k = 16$ $y = 16/x^3$		B1 M1 A1	
18. *(b)* −0·25		B1	FT in parts *(b)* and *(c)* for their non-linear expression from *(a).*
18. *(c)* $x^3 = 16/0{\cdot}016$ (=1000) (x =) 10		M1 A1	
19. **To be viewed with diagram.** Strategy of sine rule to calculate the angle at E, then cosine rule. $\frac{\sin C\hat{E}D}{8{\cdot}1} = \frac{\sin 115}{13{\cdot}7}$ $\sin C\hat{E}D = \frac{\sin 115}{13{\cdot}7} \times 8 \cdot 1$ (angle CED =) 32(·4013…) (°) $AD^2 = 5{\cdot}2^2 + 13{\cdot}7^2 - 2\times5{\cdot}2\times13{\cdot}7\times\cos151(\cdot4013\ldots)$ $AD^2 = 339{\cdot}8(265\ldots)$ OR (AD =) $\sqrt{339 \cdot 8(265\ldots)}$ (AD =) 18·4(343…) (cm)	✓ ✓ ✓ ✓ ✓ ✓ ✓	S1 M1 A1 A1 M1 A1 A1	FT 93 + 26 + 'their 32·4(013…)'
20. **To be viewed with the graph.** Split into 5 areas and attempt to sum. (Volume) ½×1×(0 + 2×52 + 2×55 + 2×46 + 2×30 + 0) = 183 litres	✓ ✓ ✓ ✓	M1 M1 A1 U1	Don't penalise a more accurate approximation. Or equivalent. Areas of 26, 53·5, 50·5, 38, 15 Award for up to 1 error in reading scale. CAO.