GCSE MARKING SCHEME

SUMMER 2017

GCSE (NEW)
MATHEMATICS - UNIT 2 (HIGHER)
3300U60-1

INTRODUCTION

This marking scheme was used by WJEC for the 2017 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 **Unit 2 : Higher tier** **Summer 2017**	✓	**Mark**	**MARK SCHEME** **Comments**
1.(a) 25·1		B2	B1 for 25(·….).
1.(b) −14·3		B2	B1 for 14·3 OR −14·2(…..)
2. 3x − 2 + 2x + 1 + 5x − 9 = 180 10x = 190 x = 19 Substituting x = 19 into at least one expression. (3x – 2 =) 55(°) (2x + 1 =) 39(°) (5x – 9 =) 86(°) (So not a right-angled triangle)	✓ ✓ ✓ ✓ ✓	M1 A1 A1 M1 A1	F.T. from ax = b. Allow all 3 marks for x = 19. If x ≠ 19 F.T. 'their derived value of x'. F.T. for this A1 if x ≥ 2. Any **two** of these expressions correctly evaluated with no incorrect evaluation, provided the sum of the two found is > 90. (statement not required)
3. One correct evaluation $3 \le x \le 4$ 2 correct evaluations $3{\cdot}65 \le x \le 3{\cdot}85$, one < 0, one > 0. 2 correct evaluations $3{\cdot}65 \le x \le 3{\cdot}75$, one < 0, one > 0. $x = 3{\cdot}7$	 ✓ ✓ ✓ ✓	 B1 B1 M1 A1	*Correct evaluation regarded as enough to identify if negative or positive. Evaluations can be rounded or truncated. If evaluations not seen condone 'too high' or 'too low'.* *Look out for testing for $x^3 - 2x = 45$.* x $x^3 - 2x - 45$ 3 −24 3·1 −21·409 3·2 −18·632 3·3 −15·663 3·4 −12·496 3·5 −9·125 3·55 −7·361... 3·6 −5·544 3·65 −3·672... 3·7 −1·747 3·74 −0·166... 3·8 2·272 3·75 0·234... 3·9 6·519 3.85 4.366… 4 11 Mark final answer.
4. $16{\cdot}9^2 = 6{\cdot}5^2 + MN^2$ or equivalent. $(MN^2) = 243{\cdot}36$ or $(MN) = \sqrt{243{\cdot}36}$ (MN =) 15·6(cm)		M1 A1 A1	Allow M1 for $16{\cdot}9^2 - 6{\cdot}5^2$. C.A.O.
5. Correct construction of 90° at point B. Correct construction of angle BAC = 60°.		B2 B1	With sight of accurate 'method arcs'. e.g . (i) AB extended with arcs either side of B on extended line AB (or line AB extended by 7cm) AND arcs above or below point B). (ii) construction of 60°, 120° and a bisection. B1 for complete method but line not drawn. With sight of accurate 'method arcs' and line drawn. If all three marks gained but triangle not completed penalise −1 mark. (Treat reversal of angles as a misread.)
6. $\frac{QR}{18} = \tan 24(°)$ $QR = 18 \times \tan 24(°)$ = 8(·01..)(cm)		M1 m1 A1	OR $\frac{QR}{\sin 24} = \frac{18}{\sin 66}$ $QR = \frac{18 \times \sin 24}{\sin 66}$ C.A.O.

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7.(a) 0·3(0) on 'box C branch'.		B1	
7.(b) Sight of 0·45 × 0·7 OR 0·25 × 0·4 OR 0·3 × 0·8 0·45 × 0·7 + 0·25 × 0·4 + 0·3 × 0·8 (0·315 + 0·1 + 0·24) = 0·655 or 131/200 or equivalent ISW		 B1 M1 A1	FT 'their 0·3' from box C branch, only if, between 0 and 1. Provided less than 1.
7.(c) $\frac{1}{3}$		B1	F.T. for the fraction that is the nearest to 1− 'their 0·655' provided 0<'their 0·655'<1 Correct answer of 1/3 gains B1 regardless.
8.(a) $x(x^2 - 5)$		B1	
8.(b) $2x^2 + 5x - 12$		B2	B1 for $2x^2 + kx - 12$ OR $2x^2 + 5x + k$
8.(c) $(x - 7)(x + 4)$ ISW		B2	B1 for (x … 7)(x … 4).
9.(a) $3y = 2x + 7$		B1	
9.(b) $y = -\frac{x}{5} + 3$		B1	
10. $360 - 2 \times 37$ $= 286(^\circ)$		M1 A1	 SC1 for sight of 74(°).
11. $\frac{BD \times 5}{2} = 35$ BD = 14(cm) Cos x = $\frac{14}{32}$ $x = \cos^{-1} 0{\cdot}4375$ x = 64(°) Organisation and Communication. Accuracy of writing.	✓ ✓ ✓ ✓ ✓ ✓ ✓	M1 A1 M1 m1 A1 OC1 W1	 May be seen on the diagram. Note : If they state that AB = 14cm, or indicate on the diagram that AB = 14cm then it is M0A0 as an incorrect method used for area of a right-angled triangle (however an unattached 14cm has to be given the benefit of the doubt and be awarded M1A1). FT 'their stated or shown length BD'. FT has to use 'their BD' (not CD). Accept answer rounded or truncated. [e.g. if their BD = 7, then accept 77(·36…°)] For OC1, candidates will be expected to: • present their response in a structured way • explain to the reader what they are doing at each step of their response • lay out their explanation and working in a way that is clear and logical For W1, candidates will be expected to: • show all their working • make few, if any, errors in spelling, punctuation and grammar • use correct mathematical form in their working • use appropriate terminology, units, etc.

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12. $d(c-5) = 3c-7$	✓	B1	FT until 2nd error for equivalent level of difficulty.
$dc - 5d = 3c - 7$	✓	B1	$dc = 3c - 7 + 5d$ gains first B2.
$dc - 3c = 5d - 7$ OR $7 - 5d = 3c - dc$	✓	B1	
$c(d-3) = 5d - 7$ OR $7 - 5d = c(3-d)$	✓	B1	
$c = \frac{5d-7}{d-3}$ OR $\frac{7-5d}{3-d}$	✓	B1	Mark final answer.
			Alternative version $\left(c - 5 = \frac{3c}{d} - \frac{7}{d}\right)$ $c - \frac{3c}{d} = 5 - \frac{7}{d}$ B1 $c\left(1 - \frac{3}{d}\right) = 5 - \frac{7}{d}$ B1 $c = \frac{5 - \frac{7}{d}}{1 - \frac{3}{d}}$ B1 $c = \frac{5d-7}{d-3}$ B2 OR B1 for $c = \frac{\frac{1}{d}(5d-7)}{\frac{1}{d}(d-3)}$ oe
13. (sin BAC=) $\frac{6.4 \times \sin 46°}{5.3}$	✓✓	M2	M1 for $\frac{\sin BAC}{6.4} = \frac{\sin 46°}{5.3}$ or equivalent
60.3(006…°)	✓	A1	Allow 60(°) from correct working.
Area = ½ × 5.3 × 6.4 × sin (180° - 46° - 60.3(006..°)	✓	M1	FT 'their derived 60.3(006….°)'
= 16.2(78….cm^2) or 16.3(cm^2)	✓	A1	Accept 16(cm^2) from correct working. SC1 for 11.78(cm^2).

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14 (Greatest area =) 31.5 x 23.5 – 20.5 x 12.5 (= 740.25 – 256.25) = 484 (cm^2)		M2 A1	Award M1 for correct use of values $31< l \leq 31.5$, $23<w\leq23.5$, $20.5\leq l < 21$, $12.5\leq w<13$. OR M1 for 31.5 x 23.5 – 'area of inner rectangle' OR M1 for 'area of outer rectangle' – 20.5 x 12.5 CAO *Alternative examples for method marks* *(adding up split areas of the shaded region).* *1. Horizontal split* *2 x 31.5 x 5.5 + 2 x 12.5 x 5.5 ,* *M2* *OR* *2. Vertical split* *2 x 23.5 x 5.5 + 2 x 20.5 x 5.5 ,* *M2* *Award M1 for correct use of values $31< l \leq 31.5$, $23<w\leq23.5$, $20.5\leq l < 21$, $12.5\leq w<13$ and 'their 5.5' adjusted accordingly to their values.* *Note that the 'shaded width' need not be consistent around the inner rectangle.*
15. Enlargement with scale factor -½ and centre (7, 4)		B3	*Penalise -1 for further incorrect steps.* Award B2 for reference to any two of 'Enlargement', '-½' and 'centre (7, 4)' either identified by coordinates or joining corresponding vertices on the grid. Award B1 for reference to any one of 'Enlargement', '-½' and 'centre (7, 4)' either identified by coordinates or joining corresponding vertices on the grid. SC2 awarded for the correct two step transformation from shape A to B, e.g. enlargement SF ½ centre origin, rotation 180° about (5.25, 3) or enlargement SF ½ and 180° rotation, (both) with centre (7.4).
16.(a) $(0.8)^3$ or equivalent = 0.512 or equivalent		M1 A1	Allow $80(\%)^3$ Fractional answer: 64/125 (ISW)
16.(b) $2 \times (0.8)^2 \times 0.2$ OR equivalent = 0.256 or equivalent		M2 A1	M1 for sight of $0.8^2 \times 0.2$ or for sight of 0.128. Fractional answer: 32/125 (ISW)

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17. $-(\sqrt[3]{w})^5$ $-\frac{3}{5}w$ $-(\sqrt[5]{w})^3$ $\boxed{\frac{1}{(\sqrt[5]{w})^3}}$ $\frac{1}{(\sqrt[3]{w})^5}$		B1	
18. $x(5x-3)=7$ OR $7=x(5x-3)$ OR $5x^2-3x=7$ OR $7=5x^2-3x$ $5x^2-3x-7=0$ $x=\frac{-(-3)\pm\sqrt{(-3)^2-4\times5\times(-7)}}{2\times5}$ $=(3\pm\sqrt{149})/10$ $x=1.52$ with $x=-0.92$ (answers to 2dp)	✓ ✓ ✓ ✓ ✓	M1 A1 M1 A1 A1	'= 0' required, but may be implied by an attempt to use the quadratic formula or if $a=5, b=-3,$ $c=-7$ used in the quadratic formula. FT 'their quadratic equation' of equivalent difficulty (3 terms with at least one negative term). Allow one slip in substitution, but must be correct formula. CAO for their quadratic equation. If none of the last 3 marks awarded for solving the given equation or the correct quadratic (irrespective if any of the opening two marks awarded), and trial and improvement used, then award: SC3 for both correct solutions given, correct to 2 decimal places: $x=1.52$ with $x=-0.92$, OR SC2 for both correct solutions given, but correct to 3 (or more) decimal places: $x=1.520(6\ldots)$ with $x=-0.920(6\ldots)$ Note: no marks to be awarded for 1 correct solution from trial and improvement.
19.(a) Appropriate example: E.g. $\pi\times\pi=\pi^2$, $(1+\sqrt{3})^2=4+2\sqrt{3}$ $(\sqrt[3]{2})^2=\sqrt[3]{4}$ OR $2^{\frac{2}{3}}$		B1	The following can be applied if sight of π in the working lines or answer space: If π or 3.141… (with or without the '…') used AND either π^2 or 9.8696… (with or without the '…') seen in the answer space, this will gain the B1. However, watch out for π seen, and e.g. 3.141 and 9.8658 offered in the answer spaces. This gains B0 because 3.141^2 has been evaluated (not π^2).
19.(b) Two different irrational numbers and the correct rational number as the answer. Examples: $\sqrt{2}\times\sqrt{8}=\sqrt{16}$ (or simplified to 4) $\sqrt{12}\times\frac{1}{\sqrt{3}}=\frac{\sqrt{12}}{\sqrt{3}}$ (or simplified to 2) $\pi\times\frac{1}{\pi}=1$ $2^{\frac{1}{2}}\times2^{\frac{3}{2}}=2^2$ (answer can be simplified to 4)		B1	Answers in the boxes take precedence.

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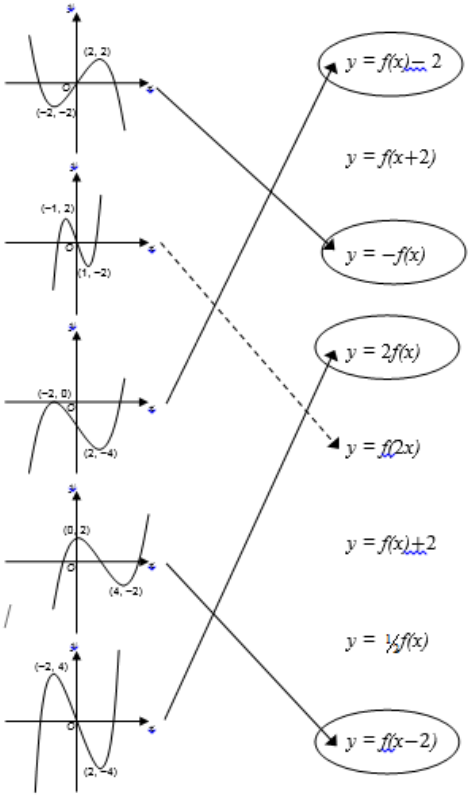
20.  		B1 B1 B1 B1	
21. Attempt to find the base diagonal ['Their face diagonal']^2 + ['Their edge']^2=20^2 $x^2 + x^2 + x^2 = 400$ OR $3x^2 = 400$ OR $x^2 = 400/3$ OR equivalent. x = √(400/3) OR 11.5(4700538…cm)	✓ ✓ ✓ ✓	S1 B1 M1 A1	e.g. diagonal^2 = x^2 + x^2 or x^2 + x^2 = 2x^2. Clear attempt at connecting their indicated face diagonal and edge of cube with the internal diagonal. This mark implies S1. Correct equation connecting edges and internal diagonal. This mark implies S1 B1. CAO SC2 for an answer of 11.5(…cm) from a correct trial and improvement method, OR SC2 for an unsupported 11.5(…cm) SC1 for two correct evaluations of 11≤x≤12 from a correct trial and improvement method with one < 400 and one > 400.