GCSE MARKING SCHEME

AUTUMN 2016

MATHEMATICS (NEW)
UNIT 2 - HIGHER TIER

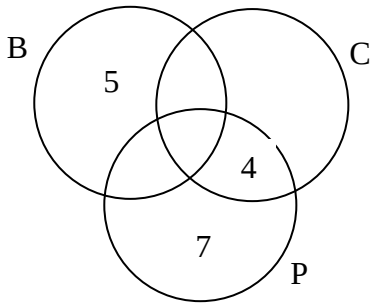
3300U60-1

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 Unit 2 : Higher Tier Autumn 2016	✓	**Mark**	**Comment**
1.(a) Correct reflection in $y = x$		B2	B1 for a correct reflection in $y = -x$ or for sight of line $y = x$.
1. (b) (i) Correct translation.		B1	
1. (b) (ii) $\begin{pmatrix}5\\4\end{pmatrix}$		B1	B0 for 5 (missing brackets) OR (5,4) 4 B0 for $\frac{5}{4}$ with or without brackets.
2. 8 11 16		B2	B1 for two correct OR for 7, 8, 11. OR for 11, 16, 23.
3. (a) x^9		B1	
3. (b) $4x - 7y$		B1	
3. (c) $2x$		B1	
4. One correct evaluation $2 \le x \le 3$ 2 correct evaluations $2{\cdot}15 \le x \le 2{\cdot}35$, (one value < 0, one value > 0.) 2 correct evaluations $2{\cdot}25 \le x \le 2{\cdot}35$, (one value < 0, one value > 0.) $x = 2{\cdot}3$	 ✓ ✓ ✓ ✓	 B1 B1 M1 A1	*Correct evaluation regarded as enough to identify if negative or positive. If evaluations not seen accept 'too high' or 'too low'.* $\underline{x}$ $\underline{2x^3 - 3x - 17}$ 2 −7 2·1 −4·778 2·2 −2·304 2·3 0·434 2·15 −3·573... 2·4 3·448 2·25 −0·968... 2·5 6·75 2·26 −0·693... 2·6 10·352 2·27 −0·415... 2·7 14·266 2·28 −0·135... 2·8 18·504 2·29 0·147... 2·9 23·078 2·35 1·905... 3 28
5.(a)  5 in correct position. 4 in correct position. 7 in correct position.		 B1 B1 B1	 Strict FT 'their entries such that total number of students = 28. Allow 'double entries' in some parts for this FT, e.g. 'the 4 placed alongside the 1'.
5.(b) 2		B1	Allow 'double entries' in some parts for a possible FT, e.g. 'the 4 placed alongside the 2'.
5.(c) $\frac{16}{28}$ or equivalent ISW		B2	FT 'their total number for Biology' for the numerator. Allow 'double entries'. B1 for a correct numerator in a fraction <1. B1 for a denominator of 28 in a fraction <1. Penalise −1 for only words (16 out of 28) or only ratio (16:28).

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6.(a) (i) 2		B1	Accept 12/6 or equivalent. The correct gradient has to be unambiguously shown. $y = 2x + 4$ is B0. Allow e.g. y = (2) x + 4 for B1.
6.(a) (ii) $y = 2x + 4$		B2	F.T. 'their gradient' from (a) only if a whole number. B1 for $y = 2x \pm k$. B1 for $y = kx + 4$. B1 for 2x +4 ('y=' missing)
6.(b) (Both have) equal gradients of 2·5.		B2	Accept equivalent of 2·5. Accept $y = 2{\cdot}5x - 1{\cdot}5$ AND $y = 2{\cdot}5x + 1{\cdot}75$ for B2 unless a contradiction is seen. B1 for stating 'equal gradients' but not given as 2·5. B1 for sight of 2·5, or equivalent, but no mention of gradient. Also Correctly rewriting the equation(s) such that they show equal corresponding x and y coefficients, e.g. 2y = 5x – 3 and 2y = 5x + 3·5 gains a B1. In this case they need to make a further statement to show an understanding of gradients to gain 2nd B1.
7.(a) 3000 × 0·05 or equivalent. = 150		M1 A1	Allow 5% of 3000 for the M1. C.A.O. SC1 for sight of 3000 × 0·05 (= 150) within an incorrect solution. e.g. 1000 × 0·03 + 2000 × 0·042 + 3000 × 0·05 +… (= 30 + 84 + 150 + …..)
7.(b) 0·048 or equivalent e.g. 4·8% or 240/5000 Explanation e.g. 'all data used', 'last point plotted', 'the number of sockets tested was the highest'.		B1 B1	ISW from an answer given as a fraction. Accept any indication that the final reading should give the best estimate.

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8. BDC = 28(°) BCD = 90(°) BD = $\frac{4{\cdot}7}{\text{Sin } 28}$ BD = 10(·…)(cm)	 ✓ ✓ ✓✓ ✓	 B1 B1 M2 A1	*Angles may be shown on the diagram.* Allow D = 28. May be implied in later work. (Allow this B1 for any use of a right-angle triangle trigonometric relationship for triangle BCD) This implies previous B mark. FT 'their BDC'. M1 for $\frac{4{\cdot}7}{BD} = \sin 28$. *Alternative method* *COB = 56(°)* *B1* *OB* $= \frac{2{\cdot}35}{\sin 28}$ *M2* *(M1 for* $\frac{2{\cdot}35}{OB} = \sin 28$ *)* *OB = 5(·…)(cm)* *A1* *BD = 10(·..)(cm)* *A1*
Organisation and Communication	✓	OC1	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
Accuracy of writing	✓	W1	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.
9.(a) $(x - 6)(x + 4)$ $(x =) 6$ AND $(x =) -4$		B2 B1	B1 for $(x \ldots 6)(x \ldots 4)$. Strict F.T. from their brackets. Allow the following. B2 for x – 6 (=0) AND x + 4 (=0) (B1) (x =) 6 AND (x =) − 4 (B1) B1 for x + 6 (=0) AND x − 4 (=0) (B0) (x =) −6 AND (x =) 4 (B1) FT B1 if only (x =) 6 AND (x =) – 4 seen (B1)
9.(b) $\frac{12x - 9 + 7x + 1}{(6)} = \frac{87}{(6)}$ $19x = 95$ $x = 5$	✓✓ ✓ ✓	B2 B1 B1	F.T. until 2nd error. B1 for 1 error. Subsequent work may show use of common denominator in order to award the B2. B0 for 95/19. If a F.T. answer is not a whole number then allow answer in form '*a / b'.* Mark final answer. Allow a correct embedded answer.

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10. Correct enlargement		B3	Otherwise B2 for 2 correct vertices within a triangle. OR for 3 correct vertices in the correct location not joined to form the triangle OR inverted triangle of correct size in incorrect position OR consistent correct use of an incorrect negative scale factor B1 for 1 or 2 correct points OR consistent use of scale factor +2 (in correct position) OR consistent use of an incorrect negative scale factor in incorrect position.
11. Sight of 37.5 × 25.5= 956.25 (cm^2)		M1 A1	 CAO. Mark final answer. If no marks gained award SC1 for 956, 956.2 or 956.3
12.(a) $(x – 7)(x – 5)$		B2	B1 for $(x – 7)(x – 7 + 2)$ or $(x – 7)(x + k)$ with $k \neq 0$ OR $(x \ldots 7)(x \ldots 5)$
12.(b) $3(4x^2 – 9y^2)$ $3(2x + 3y)(2x – 3y)$		B1 B2	 B1 for $3(2x \ldots 3y)(2x \ldots 3y)$ OR $(2x + 3y)(2x – 3y)$ *Alternative method* *Award B2 for:* $(6x + 9y)(2x - 3y)$ *or* $(2x + 3y)(6x - 9y)$ *SC2* $12(x + 1.5y)(x - 1.5y)$ *OR* $27\left(\frac{2}{3}x + y\right)\left(\frac{2}{3}x - y\right)$ *or equivalent.* *SC1* $(\sqrt{12}x + \sqrt{27}y)(\sqrt{12}x - \sqrt{27}y)$ *OR* $(2\sqrt{3}x + 3\sqrt{3}y)(2\sqrt{3}x - 3\sqrt{3}y)$ *o.e.*
13. $ax – ab = cx – dx$ $ax – cx + dx = ab$ OR $–ab = cx – dx – ax$ $x(a – c + d) = ab$ OR $–ab = x(c – d – a)$ $x = ab/(a – c + d)$ OR $–ab/(c – d – a) = x$ or $\frac{ab}{a-c+d}$ or $\frac{-ab}{c-d-a}$	 ✓ ✓ ✓ ✓	 B1 B1 B1 B1	FT until 2nd error for equivalent level of difficulty. Or equivalent. Or equivalent. Or equivalent. Do not accept $–x = ab/(c – d – a)$ *Alternative method* $ax - ab = x(c - d)$ *B1* *Only award the first* $-ab = x(c - d) - ax$ *B1* *B1 if the 2nd step is* $-ab = x(c - d - a)$ *B1* *attempted.* $-ab/(c - d - a) = x$ *B1*
14. (a) $\theta = (65\times360)/(10^2 \times \pi)$ $\theta = 74.48(°)$		M2 A1	Award M1 for $\theta \div 360 \times \pi \times 10^2 = 65$ Accept answers in the range 74.47 to 74.53 or 74 or 75.
14. (b) EF = $(74.48/360) \times 2 \times \pi \times 10$ = 13(cm)		M1 A1	FT their '74.48'. Accept answers between 12.9 and 13.1, truncated or rounded. Allow in terms of π, e.g. $\frac{931}{225}\pi$ *Alternative (the major sector arc)* *Allow* $285.52/360 \times 2 \times \pi \times 10$ *M1* *= 49.8(3…) or 50(cm)* *A1*

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15. TRUE FALSE TRUE FALSE		B2	B1 for any 3 correct responses.
16. $(3x-1)^2 = 9x^2 - 3x - 3x + 1$ $\ldots. = 2x^2 + 3x + 7$ $7x^2 - 9x - 6 = 0$ $(x =) \frac{-(-9) \pm \sqrt{(-9)^2 - 4 \times 7 \times (-6)}}{2 \times 7}$ $= \frac{9 \pm \sqrt{249}}{14}$ $x = 1.77$ AND $x = -0.48$ (answers to 2dp)	✓ ✓ ✓ ✓ ✓	B1 B1 B1 M1 A1 A1	CAO. '= 0' may be implied in further working. FT 'their derived quadratic equation' set to zero and of equivalent level of difficulty (a, b and c are non-zero). Allow one slip in substitution, but must be correct formula. If one slip seen or a positive b used award A0. CAO
17. Linear scale factor $= \sqrt{\frac{700}{140}}$ (=√5) OR $\sqrt{\frac{140}{700}}$ ($=\frac{\sqrt{5}}{5}$) $83 \times \sqrt{5}$ OR $83 \div \frac{\sqrt{5}}{5}$ = 185(.59…cm) or $83\sqrt{5}$		B1 M1 A1	Or equivalent. FT their linear scale factor.
18. (a) Sight of (360/18=) 20° $x^2 = 10^2 + 7^2 - 2 \times 10 \times 7 \times \cos 20°$ x = 4.17(6...) or x = 4.2 or x = 4.18 Perimeter = 75(.17… cm)	✓ ✓ ✓✓ ✓	B1 M1 A2 B1	May be seen in 18(a) or 18(b). FT 'their 20°' A1 for x^2 = 17.4(43…) FT 18x provided B1 and M1 awarded
18. (b) ½ × 10 × 7 × sin20° = 11.97(07…cm²) OR 12(cm²) (Area of star) = 215(.47… cm²)		M1 A1 A1	FT their angle from (a) FT 18 × 'their 11.97…' *<u>Alternative method (Area of a kite)</u> Calculating shorter diagonal of the kite by using either: $2 \times 7 \times \sin 20°$ or (cosine rule) $\sqrt{(7^2 + 7^2 - 2 \times 7 \times 7 \times \cos 40°)}$ $= 4.78(828\ldots cm^2)$ Area of the kite: ½ ×10×4.78(828…) M1, FT 'their 4.78…', provided there is evidence the shorter diagonal has been calculated correctly, e.g. using the 2 methods above. =23.94(141….) A1 (Area of star)= 215(.47…. cm^2) A1*