GCSE MARKING SCHEME

AUTUMN 2017

GCSE
MATHEMATICS - COMPONENT 2 (HIGHER)
C300UB0-1

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.

Eduqas GCSE Mathematics Autumn 2017 Component 2 Higher Tier	Mark	Comment
1. $2 \times 330 \div 15$ (£)44	M1 A1 (2)	For a full method although may be seen in stages
2. 3000×1.025^7 (£)3566(.0572…) (£)434	M1 A1 B1 (3)	Or equivalent full method. Use of 25% in the calculation is <u>not</u> a misread CAO Provided at least 6 years of correct calculations, with incorrect interpretation of the number of years, allow MR-1, then possible M1, A1 but B0
3(a) Midpoints 2, 5, 8, 12 $2\times4 + 5\times14 + 8\times10 + 12\times2$ $\div 30$ 6(.0666…mm)	B1 M1 m1 A1	 FT 'their midpoints' provided these are at the bounds or within the groups (8 + 70 + 80 + 24 = 182)
3(b) Explanation, e.g. 'Hightown is only an estimate', 'Hightown mean was calculated using midpoints', 'more of the Hightown results might be below the midpoints'	E1 (5)	Accept a suitable example
4(a) 2	B1	
4(b) 'Yes' selected or unambiguously implied AND a reason, e.g. 'Yes, 4 + 5', 'Yes it is possible to score 9'	B1	Ignore further irrelevant statements
4(c) States or implies that the list to score 5 is incomplete, e.g. 'Ryan has missed 4+1 and 3+2 States or implies that <u>number of ways of scoring 5</u> the number of outcomes is a correct method 4/20 (= 1/5)	M1 M1 A1 (5)	 Accept sight of $\frac{4}{\text{'their number of outcomes'}}$, provided 'their number of outcomes > 10, or sight of 1/5 ISW. Depends on M1, M1 previously awarded *If no marks, allow SC1 for an answer of 2/20 or equivalent*

5(a) $11x - 9x = 25 + 3$ $2x = 28$ or $x = 28/2$ $x = 14$	B1 B1 B1	FT until 2nd error
5(b) $5x(x + 2)$	B2 (5)	B1 for a correct partially factorised answer, or $5x(x \ldots)$ or $5x(\ldots + 2)$
6(a)(i) $w + 7$ and 30 inserted, or equivalent	B1	Accept 2×15 for 30
6(a)(ii) $w^2 + 7w = 30$ leading to $w^2 + 7w - 30 = 0$	B1	CAO Must be convincing from their manipulation of algebraic terms
6(a)(iii) $(w+10)(w - 3)$ $w = 3$ with $w = -10$	B2 B1	B1 for $(w - 10)(w + 3)$ FT from B1
6(a)(iv) $(7 - w =)$ 4 (cm) **and** $(2w =)$ 6 (cm)	B1	CAO There should not be any evidence of working with a negative value for w, without it being dismissed. If not dismissed, then B0
6(b) Use of right-angled triangle with trigonometry with sight of 4.4 or 18.6 – 14.2 $(y =) \tan^{-1} \frac{3.3}{18.6 - 14.2}$ or equivalent 36(.8698…°) or 36.9(°) or 37(°)	S1 M2 A1 (10)	 M1 for $\tan y = \frac{3.3}{18.6 - 14.2}$ or equivalent ISW following sight of 36.86… Do not accept 36.8(°)
7. Density $\frac{1538}{4/3 \times \pi \times 3.6^3}$ (g/cm^3) 7.86(… g/cm^3) or 7.87 (g/cm^3) AND states 'iron'	M3 A2 (5)	M2 for $\frac{1.538}{4/3 \times \pi \times 3.6^3}$ or with other place value error, OR M1 for 'digits 1538' 'their volume' provided 'their volume' is dimensionally correct OR M1 for sight of $4/3 \times \pi \times 3.6^3$ CAO A1 for 7.86(…(g/cm^3)) or 7.87 (g/cm^3)
8. $\pi \times 1.22$ (m) or $\pi \times 0.00122$ (km) $\times 2.4 \times 10^6$ For an answer in the range 9193 to 9200 (km)	M1 m1 A1 (3)	Or equivalent Allow M1 for $\pi \times 1.22 \times n$ or $\pi \times 0.00122 \times n$ where $n > 1$ CAO. No FT from incorrectly considering more than 1 wheel

9(a) (3x + 11y =) 180	B1	
9(b) 6x + 7y = 180 Method to eliminate variable, e.g. equal coefficients and method to find second variable First variable Second variable OR (from 1st variable y = 12) 3x = 48 Decision to evaluate (7y (=84),) 4y (=48) and 3x (=48) with a conclusion, e.g. 'ABC is an isosceles triangle as 4y = 3x = 48'	B1 M1 A1 A1 E2 (7)	 FT provided at least one equation is correct and the other is of equivalent difficulty. Allow 1 error in one term, not one with equal coefficients **x = 16** or **y = 12** FT their first variable provided M1 previously awarded CAO, not FT. Accept 'therefore' as a conclusion correct angles stated FT for award of E1 only, for an attempt to evaluate at least 4y with 3x using 'their x' and 'their y' *Alternative:* *6x + 7y = 180* *B1* *6x + 7y = 3x + 11y or 6x = 4y + 3x or equivalent* *M1* *6x – 3x = 11y – 7y or 6x – 3x = 4y* *A1* *(so) 3x = 4y* *A1* *Conclusion that this gives 2 equal angles in the triangle (so it is isosceles)* *E2*
10(a) y = 4 – 3x	B1	
10(b) y = 2x + 4	B2 (3)	B1 for y = 2x ± … or y = …x + 4
11(a) 138(°)	B2	B1 for sight of an appropriate 48(°) and 42(°), or for 180(°) – 42(°) or 132(°) or 360(°) – 90(°) – 132(°)
11(b) Start to Dolphin Reach = $\frac{3.8}{\sin 54°}$ 4.7 (km)	M2 A2 (6)	M1 for sin54° = 3.8/distance A1 for 4.697…(km) rounded or truncated (other than to 2 s.f. as required)

12. Idea to work with the area of the cross-section × width of the pool	S1	
Area of the cross-section, e.g. trapezium ½ (1.4 + 2.2) × 20, or 2 rectangles x × 1.4 + (20 – x) × 2.2 where x is a value **used** < 20, or other more complex split of areas	M1	Candidates may split the area into a number of trapezia or rectangles Allow 1 slip or 1 error
Area of cross-section × 12	m1	
Volume, e.g. Using: Trapezium or 2 rectangles x = 10 432 (m^3), Two rectangles x = 8 451.2 (m^3), Two rectangles x = 12 412.8 (m^3)	A1	Volume calculated correctly Do not FT from 1 slip or 1 error Two rectangles x =1 518.4 (m^3) Two rectangles x = 19 345.6 (m^3)
Assumption, e.g. correct description of the pool floor used, i.e. cross-section is a trapezium or split into rectangles, OR e.g. correct description of the sides being vertical	E1	FT provided S1 awarded
Showing or describing the impact of the assumption, with the actual volume possibly being the same or greater or less than the one calculated	E1 (6)	FT provided S1 awarded
13(a)		May be completed for each of the 3 days separately
(Total distance =) 52 × 3½ + 45 × 2⅓ + 44 × 1.75 (= 182 + 105 + 77)	M2	For M2 allow use of 2.33 for 2⅓, but not 2.3 M1 for incorrect notation, 3(.)30 for 3.5 hours, 2(.)20 for 2 hours 20 minutes and 1(.)45 for 1 hour 45 minutes, OR M1 for any 1 of the 3 terms correct
364 (miles)	A1	CAO, do not accept 363.85 from use of 2.33 for 2⅓ May be implied in further work
(Number of gallons of fuel used) 364 ÷ 40 AND (Number of litres used) ÷ 0.22 (= 41.36... litres)	M2	FT 'their derived 364' (= 9.1 gallons) M1 for 364 ÷ 40 or 364 ÷ 0.22
(Cost is) 41.36… × 1.25	m1	FT provided the previous M2 awarded
(£) 51.7(0)	A1	CAO, although accept answers in the range (£)51.62 to (£)52 inclusive

13(b)(i) Estimate (£)103.40 to (£)103.41 or (£)103 or (£)100 or (£)104 or (£)105 or (£)110	B1	Allow answers in the range (£)100 to (£)110 If an amount is not (£)103.40 to (£)103.41, then 'their estimate' must be a whole number of £s Similarly accept FT '2 × their (a)' with an equivalent range
13(b)(ii) Reason, e.g. 'don't know distance travelled', 'don't know his speed for this other time', 'could be different fuel consumption', 'price of fuel might change'	E1 (9)	Do not accept, e.g. 'because it is not accurate'
14(a) 2 (tiles left over)	B2	B1 for (Pattern 5 uses) 73 (tiles) or $75 - (2 \times 6^2 + 1)$
14(b) $2(n+1)^2 + 1$ or $2n^2 + 4n + 3$ or equivalent	B2	ISW B1 for sight of $(n + 1)^2$ or equivalent or for sight of $2n^2$
14(c) Demonstrates correctly, e.g. $2 \times 20^2 + 1 = 801$ and $2 \times 19^2 + 1 = 723$, OR (omitting the +1), considering $2 \times 19^2 = 722$ and $2 \times 20^2 = 800$, OR $(n + 1)^2 = 397.5$ with an indication that n cannot be a whole number, OR statement that complete designs all have an odd number of tiles, i.e. '796 is not odd and all designs use an odd number of tiles', or '796 is even and all designs use an odd number of tiles' OR $2n^2 + 4n + 3 = 796$ so $2n^2 + 4n - 793 = 0$ with substitution of n = 18 to give -73, n = 19 to give 5	B1 (5)	
15(a) 0.3 indicated for no cereal Idea $0.7 \times \ldots = 0.28$ P(toast) = 0.4 Second branches 0.4 0.6 0.4 0.6	B1 M1 A1 B1	In working or on tree In working or on tree FT from their P(toast) provided M1 awarded
15(b) 0.3×0.6 $= 0.18$	M1 A1 (6)	FT 'their 0.3' × 'their 0.6' from their lowest branches in (a)

16. $(DA^2 =) 20^2 + 15^2$ or $DA^2 = 625$ or $DA = \sqrt{625}$ DA = 25 (metres)	M1 A1	
Area triangle ($\frac{1}{2} \times 15 \times 20 =$) 150 ($m^2$)	B1	
Area DAE in the range 327.08 to 327.4 or $625\pi/6$ (m^2)	B2	FT 'their derived 25' provided ≠15 and ≠20 B1 for $\pi \times 25^2 \times 60 \div 360$, OR B1 for an answer of 270.6 to 271 (m^2) *from* *Area DAE as a triangle, FT 'their 25' for DA:* *$\frac{1}{2} \times 25 \times 25 \times \sin 60° =$ 270.6(3.. m^2) OR* *½DE straight = 25 × sin30° = 12.5(m) and* *A to midpoint DE = 25 × cos30° = 21.65(… m), and* *12.5 × 21.65(…) = 270.6(3…m^2)*
Area CAB in the range 88.3 to 88.4 or $225\pi/8$ (m^2)	B2	B1 for $\pi \times 15^2 \times 45 \div 360$, OR B1 for an answer of 79.5 to 80 (m^2) *from* *Area CAB as a triangle:* *$\frac{1}{2} \times 15 \times 15 \times \sin 45° =$ 79.5(4.. m^2) OR* *½CB straight = 15 × sin22.5° = 5.7(4…m) and* *A to midpoint CB = 15 × cos22.5° = 13.8(58… m),* *and 5.7(4…) × 13.8(58…) = 79.5(4…m^2)*
Total area answer in the range 565 to 566 (m^2)	B1	CAO. Not FT from area of triangles
Assumption, e.g. '(area of) sector(s) of a circle', 'Shireen is correct to think DA = EA', 'Shireen is correct in thinking AC = AB'	E1	Allow descriptions of a sector of a circle *FT assumption '(area of) triangle(s)' provided implies knowing that 'their area(s)' will be less than the actual area(s)*
	(9)	
17(a)(i) $(10/6)^3 \times 0.4$ 1.8(5.. litres) or 1.9(litres)	M1 A1	
17(b) $\pi \times r^2 \times 4r = 30\,000$ OR $\pi \times (h/4)^2 \times h = 30\,000$	M2	Accept use of letters other than 'r' M1 for $\pi \times r^2 \times h = 30\,000$, or for sight of $\pi \times r^2 \times 4r$
$r^3 = 30\,000/4\pi$ OR $h = \sqrt[3]{(16 \times 30\,000 \div \pi)}$	A1	(r^3 =2387. …) (h^3 = 152 788.745… giving h = 53.46… (cm))
Radius of the drum is in the range 13.36 (cm) to 13.4 (cm)	A1	CAO, although accept rounded or truncated answers from correct working.
	(6)	

18. $5x^2 + 10x - 73 = 0$ or $x^2 + 2x - 14.6 = 0$ $(x =) \frac{-10 \pm \sqrt{(10^2 - 4\times5\times-73)}}{2 \times 5}$ or $\frac{-2 \pm \sqrt{(2^2 - 4\times1\times-14.6)}}{2 \times 1}$ or $(x =) \frac{-10 \pm \sqrt{1560}}{10}$ or $\frac{-2 \pm \sqrt{62.4}}{2}$ (x =) 2.94968… with -4.94968… or $\frac{-5 \pm \sqrt{390}}{5}$	B2 M1 A1 (4)	B1 for $5x^2 + 10x = 73$ or $x^2 + 2x = 73/5$ Allow 1 slip in substitution, must be correct formula *Accept a method of completing the square, with 1 slip for M1* Accept rounded answers from correct working Allow truncated answers provided at least 2d.p. is shown, e.g. 2.94 with -4.9(4…) or 2.9 with -4.94
19(a) Either starting $x = 8 – 10/x$ or starting with $x^2 – 8x + 10 = 0$, showing the 2 stages of rearrangement	B1	2 stages required either multiplication by x and '= 0', or division by x and isolating the original 'x^2' term
19(b) ($x_1 = 5$ gives) $x_2 = 6$ Sight of $x_7 = 6.449…$ **OR** $x_8 = 6.449…$ Solution to 2 d.p. is 6.45	M1 m1 A1 (4)	 Must be shown to at least 3 d.p. Do not allow FT from M0 *$x_2 = 6$* *$x_3 = 6.333…$* *$x_4 = 6.421…$* *$x_5 = 6.4426…$* *$x_6 = 6.4478…$* *$x_7 = 6.449…$* *$x_8 = 6.449…$*
20(a) $(27) \div 60 \div 60 \times 1000$ 7.5 (m/s) Reading from graph 40 (seconds)	M1 M1 A1 B1	 FT from 'their 7.5 m/s' provided at least M1 previously awarded
20(b)(i) Sight of tangent at t = 30 Use of $\frac{\text{difference in vertical}}{\text{difference in horizontal}}$ Correct evaluation (m/s^2 or ms^{-2})	S1 M1 A1	 Must be negative
20(b)(ii) Reasonable statement, e.g. 'the trend is positive acceleration not negative', 'at t=30 it is almost zero acceleration but generally it is positive'	E1	Allow FT from (b)(i) being zero, but no FT from (b)(i) being positive

20(c) Attempt to find at least one point, i.e. value of v for $0 < t \leq 60$ At least 2 correct plots or 2 appropriate values of v Suitable curve between 20 and 30, or 3 values of v evaluated in the interval $20 \leq t \leq 30$, or 2 values of v evaluated in the interval $25 \leq t \leq 26$ 24 to 26 seconds (to the nearest second)	S1 P1 C1 B1 (12)	<table><tr><td>t</td><td>(0)</td><td>10</td><td>20</td><td>30</td><td>40</td><td>50</td><td>60</td></tr><tr><td>v</td><td>(5)</td><td>5.1</td><td>5.4</td><td>5.9</td><td>6.6</td><td>7.5</td><td>8.6</td></tr></table> Note: <table><tr><td>t (s)</td><td>24</td><td>25</td><td>26</td></tr><tr><td>v (m/s) from drawn graph</td><td>5.6</td><td>5.8</td><td>6</td></tr><tr><td>v (m/s) calculated from formula</td><td>5.576</td><td>5.625</td><td>5.676</td></tr></table>
21. Cos A = $\frac{6.3^2 + 8.4^2 - 12.4^2}{2 \times 6.3 \times 8.4}$ (=-0.41109…) A = 114.27(…°) or 114.3(°) Use of acute A in trig ratio sin 65.7(°) = $\frac{\text{perpendicular}}{6.3}$ **or** perpendicular = 6.3 × sin 65.7(°) Perpendicular height 5.7(43…cm)	M2 A1 m1 A1 (5)	M1 for sight of $12.4^2 = 6.3^2 + 8.4^2 - 2 \times 6.3 \times 8.4 \times \cos A$ FT from M2 for 'their acute A' *Alternatives:* *Cos B = $\frac{12.4^2 + 8.4^2 - 6.3^2}{2 \times 12.4 \times 8.4}$* *M2* *(= 0.886…)* *(OR M1 for sight of* *$6.3^2 = 12.4^2 + 8.4^2 - 2 \times 12.4 \times 8.4 \times \cos B$)* *B = 27.59(…°) or 27.6(°)* *A1* *sin 27.59(….°) = $\frac{\text{perpendicular}}{12.4}$* *m1* ***or*** *perpendicular = 12.4 × sin 27.59(°)* *(FT provided M2 previously awarded)* *Perpendicular height 5.7(43…cm)* *A1* *OR* *$12.4^2 = h^2 + (x + 8.4)^2$ and $6.3^2 = h^2 + x^2$* *M2* *(OR M1 for sight of either equation)* *$12.4^2 = 6.3^2 - x^2 + (x + 8.4)^2$* *m1* *or* *$x = \frac{12.4^2 - 6.3^2 - 8.4^2}{2 \times 8.4}$* *x = 2.58988…(cm) or 2.6(cm)* ***and*** *m1* *$h^2 = 6.3^2 - 2.58988\ldots^2$ (=32.98….)* *(FT 'their x' provided M2 previously awarded)* *Perpendicular height 5.7(43…cm)* *A1* *(A = obtuse base angle, B = acute base angle)*