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# **GCSE MARKING SCHEME**

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**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. $3000 \times 1.025^7$ (£)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 $2 \times 4 + 5 \times 14 + 8 \times 10 + 12 \times 2$  $\div 30$  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 $\frac{4}{20}$ 'their number of outcomes', provided 'their number of outcomes > 10, or sight of 1/5  ISW. Depends on M1, M1 previously awarded <i>If no marks, allow SC1 for an answer of 2/20 or equivalent</i>

5(a) $11x - 9x = 25 + 3$ $2x = 28$ or $x = 28/2$ $x = 14$	B1 B1 B1	FT until 2 <sup>nd</sup> error
5(b) $5x(x + 2)$	B2  (5)	B1 for a correct partially factorised answer, or $5x(x \dots)$ or $5x(\dots + 2)$
6(a)(i) $w + 7$ and 30 inserted, or equivalent	B1	Accept $2 \times 15$ 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) <b>and</b> $(2w =) 6$ (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  $36(.8698\dots^\circ)$ or $36.9^\circ$ or $37^\circ$	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 $36.8^\circ$
7. Density $\frac{1538}{4/3 \times \pi \times 3.6^3}$ (g/cm <sup>3</sup> )    $7.86(\dots \text{g/cm}^3)$ or $7.87$ (g/cm <sup>3</sup> ) 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 $7.86(\dots(\text{g/cm}^3))$ or $7.87$ (g/cm <sup>3</sup> )
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



<p>12. Idea to work with the area of the cross-section <math>\times</math> width of the pool</p> <p>Area of the cross-section, e.g. trapezium <math>\frac{1}{2} (1.4 + 2.2) \times 20</math>, or 2 rectangles <math>x \times 1.4 + (20 - x) \times 2.2</math> where <math>x</math> is a value <b>used</b> <math>&lt; 20</math>, or other more complex split of areas</p> <p>Area of cross-section <math>\times 12</math></p> <p>Volume, e.g. Using: Trapezium or 2 rectangles <math>x = 10</math> <math>432 \text{ (m}^3\text{)},</math> Two rectangles <math>x = 8</math> <math>451.2 \text{ (m}^3\text{)},</math> Two rectangles <math>x = 12</math> <math>412.8 \text{ (m}^3\text{)}</math></p> <p>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</p> <p>Showing or describing the impact of the assumption, with the actual volume possibly being the same or greater or less than the one calculated</p>	<p>S1</p> <p>M1</p> <p>m1</p> <p>A1</p> <p>E1</p> <p>E1</p> <p>(6)</p>	<p>Candidates may split the area into a number of trapezia or rectangles Allow 1 slip or 1 error</p> <p>Volume calculated correctly Do not FT from 1 slip or 1 error</p> <p>Two rectangles <math>x = 1</math> <math>518.4 \text{ (m}^3\text{)}</math> Two rectangles <math>x = 19</math> <math>345.6 \text{ (m}^3\text{)}</math></p> <p>FT provided S1 awarded</p> <p>FT provided S1 awarded</p>
<p>13(a)</p> <p>(Total distance =) <math>52 \times 3\frac{1}{2} + 45 \times 2\frac{1}{3} + 44 \times 1.75</math> <math>(= 182 + 105 + 77)</math></p> <p style="text-align: right;">364 (miles)</p> <p>(Number of gallons of fuel used) <math>364 \div 40</math></p> <p>AND (Number of litres used) <math>\div 0.22</math> <math>(= 41.36\dots \text{ litres})</math></p> <p>(Cost is) <math>41.36\dots \times 1.25</math></p> <p style="text-align: right;">(£) 51.7(0)</p>	<p>M2</p> <p>A1</p> <p>M2</p> <p>m1</p> <p>A1</p>	<p>May be completed for each of the 3 days separately</p> <p>For M2 allow use of 2.33 for <math>2\frac{1}{3}</math>, 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</p> <p>CAO, do not accept 363.85 from use of 2.33 for <math>2\frac{1}{3}</math> May be implied in further work</p> <p>FT 'their derived 364' <math>(= 9.1 \text{ gallons})</math> M1 for <math>364 \div 40</math> or <math>364 \div 0.22</math></p> <p>FT provided the previous M2 awarded</p> <p>CAO, although accept answers in the range (£)51.62 to (£)52 inclusive</p>



<p>16. (<math>DA^2 = 20^2 + 15^2</math> or <math>DA^2 = 625</math> or <math>DA = \sqrt{625}</math>  <math>DA = 25</math> (metres)</p> <p>Area triangle (<math>\frac{1}{2} \times 15 \times 20 =</math>  <math>150</math> (<math>m^2</math>)</p> <p>Area DAE in the range  <math>327.08</math> to <math>327.4</math> or <math>625\pi/6</math> (<math>m^2</math>)</p> <p>Area CAB in the range  <math>88.3</math> to <math>88.4</math> or <math>225\pi/8</math> (<math>m^2</math>)</p> <p>Total area answer in the range  <math>565</math> to <math>566</math> (<math>m^2</math>)</p> <p>Assumption, e.g. '(area of) sector(s) of a circle', 'Shireen is correct to think <math>DA = EA</math>', 'Shireen is correct in thinking <math>AC = AB</math>'</p>	<p>M1</p> <p>A1</p> <p>B1</p> <p>B2</p> <p>B2</p> <p>B1</p> <p>E1</p> <p>(9)</p>	<p>FT 'their derived 25' provided <math>\neq 15</math> and <math>\neq 20</math>  B1 for <math>\pi \times 25^2 \times 60 \div 360</math>, OR</p> <p>B1 for an answer of <math>270.6</math> to <math>271</math> (<math>m^2</math>) from <u>Area DAE as a triangle. FT 'their 25' for DA:</u>  <math>\frac{1}{2} \times 25 \times 25 \times \sin 60^\circ = \underline{270.6(3.. m^2)}</math> OR  <math>\frac{1}{2} DE</math> straight <math>= 25 \times \sin 30^\circ = 12.5(m)</math> and  A to midpoint DE <math>= 25 \times \cos 30^\circ = 21.65(... m)</math>, and  <math>12.5 \times 21.65(... ) = \underline{270.6(3...m^2)}</math></p> <p>B1 for <math>\pi \times 15^2 \times 45 \div 360</math>, OR</p> <p>B1 for an answer of <math>79.5</math> to <math>80</math> (<math>m^2</math>) from <u>Area CAB as a triangle:</u>  <math>\frac{1}{2} \times 15 \times 15 \times \sin 45^\circ = \underline{79.5(4.. m^2)}</math> OR  <math>\frac{1}{2} CB</math> straight <math>= 15 \times \sin 22.5^\circ = 5.7(4...m)</math> and  A to midpoint CB <math>= 15 \times \cos 22.5^\circ = 13.8(58... m)</math>,  and <math>5.7(4...) \times 13.8(58...) = \underline{79.5(4...m^2)}</math></p> <p>CAO. Not FT from area of triangles</p> <p>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)</p>
<p>17(a)(i) <math>(10/6)^3 \times 0.4</math>  <math>1.8(5.. litres)</math> or <math>1.9(litres)</math></p>	<p>M1</p> <p>A1</p>	
<p>17(b) <math>\pi \times r^2 \times 4r = 30\ 000</math>  OR <math>\pi \times (h/4)^2 \times h = 30\ 000</math></p> <p><math>r^3 = 30\ 000/4\pi</math>  OR <math>h = \sqrt[3]{(16 \times 30\ 000 \div \pi)}</math></p> <p>Radius of the drum is in the range  <math>13.36</math> (cm) to <math>13.4</math> (cm)</p>	<p>M2</p> <p>A1</p> <p>A1</p> <p>(6)</p>	<p>Accept use of letters other than 'r'  M1 for <math>\pi \times r^2 \times h = 30\ 000</math>, or for sight of <math>\pi \times r^2 \times 4r</math></p> <p>(<math>r^3 = 2387. ...</math>)  (<math>h^3 = 152\ 788.745... giving h = 53.46... (cm)</math>)</p> <p>CAO, although accept rounded or truncated answers from correct working.</p>



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

<p>20(c) Attempt to find at least one point, i.e. value of <math>v</math> for <math>0 &lt; t \leq 60</math></p> <p>At least 2 correct plots or 2 appropriate values of <math>v</math></p> <p>Suitable curve between 20 and 30, or 3 values of <math>v</math> evaluated in the interval <math>20 \leq t \leq 30</math>, or 2 values of <math>v</math> evaluated in the interval <math>25 \leq t \leq 26</math></p> <p>24 to 26 seconds (to the nearest second)</p>	<p>S1</p> <p>P1</p> <p>C1</p> <p>B1</p> <p>(12)</p>	<table border="1" data-bbox="738 147 1372 215"> <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> <p>Note:</p> <table border="1" data-bbox="754 315 1388 439"> <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>	t	(0)	10	20	30	40	50	60	v	(5)	5.1	5.4	5.9	6.6	7.5	8.6	t (s)	24	25	26	v (m/s) from drawn graph	5.6	5.8	6	v (m/s) calculated from formula	5.576	5.625	5.676
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<p>21. <math>\cos A = \frac{6.3^2 + 8.4^2 - 12.4^2}{2 \times 6.3 \times 8.4}</math> (= -0.41109...)</p> <p><math>A = 114.27(\dots^\circ)</math> or <math>114.3^\circ</math></p> <p>Use of acute <math>A</math> in trig ratio <math>\sin 65.7^\circ = \frac{\text{perpendicular}}{6.3}</math> <b>or</b> perpendicular = <math>6.3 \times \sin 65.7^\circ</math></p> <p>Perpendicular height 5.7(43...cm)</p>	<p>M2</p> <p>A1</p> <p>m1</p> <p>A1</p> <p>(5)</p>	<p>M1 for sight of <math>12.4^2 = 6.3^2 + 8.4^2 - 2 \times 6.3 \times 8.4 \times \cos A</math></p> <p>FT from M2 for 'their acute A'</p> <p><i>Alternatives:</i> <math>\cos B = \frac{12.4^2 + 8.4^2 - 6.3^2}{2 \times 12.4 \times 8.4}</math> M2 (= 0.886...)</p> <p>(OR M1 for sight of <math>6.3^2 = 12.4^2 + 8.4^2 - 2 \times 12.4 \times 8.4 \times \cos B</math>)</p> <p><math>B = 27.59(\dots^\circ)</math> or <math>27.6^\circ</math> A1</p> <p><math>\sin 27.59(\dots^\circ) = \frac{\text{perpendicular}}{12.4}</math> m1 <b>or</b> perpendicular = <math>12.4 \times \sin 27.59^\circ</math> (FT provided M2 previously awarded)</p> <p>Perpendicular height 5.7(43...cm) A1</p> <p>OR</p> <p><math>12.4^2 = h^2 + (x + 8.4)^2</math> and <math>6.3^2 = h^2 + x^2</math> M2 (OR M1 for sight of either equation)</p> <p><math>12.4^2 = 6.3^2 - x^2 + (x + 8.4)^2</math> m1 <b>or</b> <math>x = \frac{12.4^2 - 6.3^2 - 8.4^2}{2 \times 8.4}</math></p> <p><math>x = 2.58988\dots(\text{cm})</math> or <math>2.6(\text{cm})</math> <b>and</b> m1 <math>h^2 = 6.3^2 - 2.58988\dots^2 (= 32.98\dots)</math> (FT 'their x' provided M2 previously awarded)</p> <p>Perpendicular height 5.7(43...cm) A1</p> <p>(A = obtuse base angle, B = acute base angle)</p>																												