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# **GCSE MARKING SCHEME**

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**SUMMER 2018**

**GCSE (NEW)  
MATHEMATICS – UNIT 1 (HIGHER TIER)  
3300U50-1**

## **INTRODUCTION**

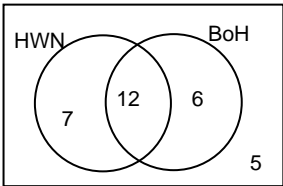
This marking scheme was used by WJEC for the 2018 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was taken so that reference could be made to the full range of candidates' 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.

# WJEC GCSE MATHEMATICS (NEW)

## SUMMER 2018 MARK SCHEME

GCSE MATHEMATICS Unit 1: Higher Tier Summer 2018	Mark	Comments
1.(a) 12	B1	
1.(b) $\times 1.04'$	B1	
1.(c) $3\frac{1}{5}$	B1	
2.(a) <div style="text-align: center; margin: 10px 0;">  </div> <p>12 AND 5 in correct position. Total of 18 for 'Bread of Heaven' Overall total of 30.</p>	B1 B1 B1	Any 'blank space' to be taken as 0. If 'notches/tallies' are used, penalise -1 once.  B0 if any other number written in the same section. Allow more than one number in the same section. Allow more than one number in the same section.
2.(b) $\frac{19}{30}$ or equivalent. ISW	B2	B1 for a numerator of 19 <u>OR</u> FT 'their total for <i>HWN</i> in a fraction < 1. B1 for a denominator of 30 <u>OR</u> FT 'their total' in a fraction < 1. An answer of 19/30 gains B2 regardless of 'their Venn diagram'. Penalise incorrect notation (e.g. '19 in 30') -1.
3.(a) $5x^2 - 2x - 3x^2 + 6x - 21$  $= 2x^2 + 4x - 21$	B2         B2	B1 for sight of $5x^2 - 2x$ . B1 for sight of $- 3x^2 + 6x - 21$ . Brackets must be removed. Allow both of the above B marks even if not part of a single expression.  <i>FT for B2 if at least two <math>x^2</math> terms AND at least two x terms to be simplified.</i> <i>FT for B1 if at least two <math>x^2</math> terms OR at least two x terms to be simplified.</i> If B2 not awarded, allow B1 for correct collection of ' $x^2$ terms' ( $2x^2$ ) OR B1 for correct collection of ' $x$ terms' ( $+4x$ ). This 2 <sup>nd</sup> B2 (or B1) is for their <b>final</b> answer. Any compensating errors leading to a 'correct' answer is B0. Penalise -1 for any attempt to equate their expression to zero (and attempting to solve) OR incorrectly factorising.

<p>3.(b) <math>22 - f = 3 \times 6</math> or equivalent.  <math>22 - 18 = f</math> OR <math>-f = 18 - 22</math>  <math>f = 4</math></p>	<p>M1 A1 A1</p>	<p>CAO. Accept <math>4 = f</math>. M1A1A0 for <math>-f = -4</math>.  Mark final answer.  Allow all 3 marks for <math>\frac{22 - 4}{3} = 6</math> with <u>no</u> further work.  Allow 2 marks for <math>\frac{22 - 4}{3} = 6</math> followed by '<math>f \neq 4</math>'.    If no marks gained,  Allow SC1 for an unsupported <math>f = -4</math>.  Allow SC1 for sight of 18 from <math>3 \times 6</math>.</p>
<p>4.(a) <math>\frac{1}{6} \times \frac{1}{6}</math>  <math>= \frac{1}{36}</math></p>	<p>M1 A1</p>	
<p>4(b)(i) <math>P(\text{Caernarfon}) = \frac{1}{4}</math> or equivalent  <math>P(\text{Newtown})</math> AND <math>P(\text{Ebbw Vale})</math>  <math>= \frac{1}{8}</math> or equivalent</p>	<p>B1  B1</p>	<p><i>Penalise incorrect notation -1 once only in 4(b)</i>  CAO.    CAO.  Do not allow 0.5/4 for 1/8.</p>
<p>4(b)(ii) <math>\frac{1}{2} + \frac{1}{8}</math>  <math>= \frac{5}{8}</math> or equivalent.</p>	<p>M1  A1</p>	<p>FT <math>\frac{1}{2} +</math> 'their <math>P(\text{Eb.V.})</math>'. Provided <math>P(\text{Eb.V.}) &lt; 1</math> for M1.  FT answer must be <math>&lt; 1</math> for A1.  Mark final answer  Allow 2.5/4 for 5/8 if answer to 4(b)(i) is 0.5/4.</p>
<p>5.(a) <math>1.56 \times 10^6</math></p>	<p>B2</p>	<p>Mark final answer.  B1 for sight of <math>15.6 \times 10^5</math> OR 1560000 OR equivalent correct value but not in standard form.</p>
<p>5.(b) <math>1.3 \times 10^5</math></p>	<p>B2</p>	<p>Mark final answer.  B1 for sight of <math>13 \times 10^4</math> OR 130000 OR equivalent correct value but not in standard form.</p>
<p>6. <math>3x(4x + y)</math></p>	<p>B2</p>	<p>Accept <math>3x(4x + 1y)</math>  B1 for <math>3x(4x \pm \dots)</math> or <math>3x(\dots + y)</math>  B1 for <math>3(4x^2 + xy)</math> or <math>x(12x + 3y)</math>.</p>
<p>7.    (ADC =) <math>109^\circ</math>  <math>x = 180 - 26 - 109</math>  <math>= 45^\circ</math></p>	<p>B1 M1 A1</p>	<p><i>Answers may be written on the diagram.</i>  Allow for sight of <math>109^\circ</math>.  FT 'their <math>109^\circ</math>' (may be clearly indicated on the diagram) <u>provided</u> <math>\neq 71</math> and <math>\neq 26</math>.  An answer of <math>45^\circ</math> gains all 3 marks.</p>

<p>8.</p> <p>Correct construction of perpendicular bisector of line AB.</p> <p>Correct construction of <math>60^\circ</math> at A.</p> <p>Arc of radius 6 cm, centre A.</p> <p>Correct region identified.</p>	<p>B2</p> <p>B1</p> <p>B1</p> <p>B1</p>	<p>Allow <math>\pm 2^\circ</math> and <math>\pm 2</math> mm.</p> <p>B1 for a perpendicular bisector with no arcs or only one pair of intersecting arcs (above or below) shown.</p> <p>B1 for two sets of correct arcs, with no line or an incorrect line.</p> <p>Must show relevant arcs.</p> <p>Must be of sufficient length so as not to be considered a 'point' or a 'notch'.</p> <p>FT for similar viable region (a straight line intersecting AB, an angle at point A and an arc with centre A) even if no previous marks gained.</p>
<p>9.</p> <p><math>\angle BXC = 80^\circ</math> Reason: 'BX = BC' OR 'Isosceles triangle'</p> <p><math>\angle AXB (= 180 - 80) = 100^\circ</math> Reason: 'Angles on a straight line'.</p> <p><math>\angle ABX (= 180 - 40 - 100) = 40^\circ</math> Reason: 'Angles in a triangle'.</p> <p>Statement 'So AX = BX', Reason: 'Two equal angles (in a triangle)' OR <math>\angle ABX = \angle BAX</math> OR 'Isosceles triangle'</p> <p>Sight of at least TWO of the above reasons.</p>	<p>B1</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>E1</p>	<p>Angles shown on the diagram take precedence. If any angle is not named then it must be unambiguously identified either on the diagram, from a given reason or in further work. (e.g. must be convincing that X = 80 is referring to BXC and not AXB.)</p> <p>If initial incorrect assumptions are made then allow correct FT methods to calculate other relevant angles.</p> <p>FT 180 – 'their <math>\angle BXC</math>'</p> <p>FT 180 – 40 – 'their <math>\angle AXB</math>'.</p> <p>Only available if <math>\angle ABX</math> <b>stated or shown</b> to be <math>40^\circ</math></p> <p>Reasons must be appropriate AND are dependent on associated B1 gained.</p>
<p><u>Alternative method 1.</u></p> <p><math>\angle BXC = 80^\circ</math> Reason: 'BX = BC' OR 'Isosceles triangle'.</p> <p><math>\angle CBX (= 180 - 80 - 80) = 20^\circ</math> Reason: 'Angles in a triangle'.</p> <p><math>\angle ABX (= 180 - 80 - 40 - 20) = 40^\circ</math> Reason: 'Angles in a triangle'.</p> <p>Statement 'So AX = BX'. Reason: 'Two equal angles (in a triangle)' OR <math>\angle ABX = \angle BAX</math> OR 'Isosceles triangle'</p> <p>Sight of at least TWO of the above reasons.</p>	<p>B1</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>E1</p>	<p>FT 180 – 80 – 'their <math>\angle BXC</math>'.</p> <p>FT 180 – 80 – 40 – 'their <math>\angle CBX</math>'.</p> <p>Only available if <math>\angle ABX</math> <b>stated or shown</b> to be <math>40^\circ</math></p> <p>Reasons must be appropriate AND are dependent on associated B1 gained.</p>
<p><u>Alternative method 2. (Assumption that AX = BX).</u></p>		

<p><math>\angle ABX = 40^\circ</math> Reason: 'AX = BX' OR 'Isosceles triangle'.</p> <p><math>\angle AXB (= 180 - 40 - 40) = 100^\circ</math> Reason: 'Angles in a triangle'.</p> <p><math>\angle BXC = 80^\circ</math> Reason: 'Angles on a straight line'.</p> <p>Statement 'So BX = BC' (as given) Reason: 'Two equal angles (in a triangle)' OR '<math>\angle BXC = \angle BCX</math>' OR 'Isosceles triangle'.</p> <p>Sight of at least TWO of the above reasons.</p>	<p>B1</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>E1</p>	<p>FT 180 – 40 – 'their <math>\angle ABX</math>'.</p> <p>FT 180 – 'their <math>\angle AXB</math>'.</p> <p>Only available if <math>\angle BXC</math> <b>stated or shown</b> to be <math>80^\circ</math></p> <p>Reasons must be appropriate AND are dependent on associated B1 gained.</p>
<p><u>Alternative method 3. (Assumption that AX = BX).</u></p> <p><math>\angle ABX = 40^\circ</math> Reason: 'AX = BX' OR 'Isosceles triangle'.</p> <p><math>\angle CBX (= 180 - 80 - 40 - 40) = 20^\circ</math> Reason: 'Angles in a triangle'.</p> <p><math>\angle BXC (= 180 - 80 - 20) = 80^\circ</math> Reason: 'Angles in a triangle'.</p> <p>Statement 'So BX = BC' (as given) Reason: 'Two equal angles (in a triangle)' OR '<math>\angle BXC = \angle BCX</math>' OR 'Isosceles triangle'.</p> <p>Sight of at least TWO of the above reasons.</p>	<p>B1</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>E1</p>	<p>FT 180 – 80 – 40 – 'their <math>\angle ABX</math>'.</p> <p>FT 180 – 80 – 'their <math>\angle CBX</math>'.</p> <p>Only available if <math>\angle BXC</math> <b>stated or shown</b> to be <math>80^\circ</math></p> <p>Reasons must be appropriate AND are dependent on associated B1 gained.</p>
<p>Organisation and Communication.</p> <p>Accuracy of writing.</p>	<p>OC1</p> <p>W1</p>	<p>For OC1, candidates will be expected to:</p> <ul style="list-style-type: none"> <li>• present their response in a structured way</li> <li>• explain to the reader what they are doing at each step of their response</li> <li>• lay out their explanation and working in a way that is clear and logical</li> </ul> <p>For W1, candidates will be expected to:</p> <ul style="list-style-type: none"> <li>• show all their working</li> <li>• make few, if any, errors in spelling, punctuation and grammar</li> <li>• use correct mathematical form in their working</li> <li>• use appropriate terminology, units, etc</li> </ul>

10. Correct enlargement	B2	<p>B1 for triangle enlarged with scale factor -2 in incorrect position (within correct quadrant) OR correct enlargement with scale factor 2 (using correct centre) OR consistent use of an incorrect <b>negative</b> scale factor (using correct centre) OR two (or three) correct vertices (not necessarily joined)</p> <p>B0 for using scale factor +1/2.</p>								
<p>11.(a) <math>y = k\sqrt{x}</math> OR <math>y^2 = cx</math> <math>30 = k \times 6</math> OR <math>30 = k \times \sqrt{36}</math> OR <math>k = 5</math> OR <math>c = 25</math></p> <p style="text-align: center;"><math>(y \Rightarrow) 5\sqrt{x}</math></p>	<p>B1 M1 A1</p>	<p>Allow <math>y \propto k\sqrt{x}</math>. (<math>y \propto \sqrt{x}</math> is insufficient.) FT from expressions of the form <math>k \times x^n</math> (<math>n \neq 1</math>) (equivalent difficulty only) M1 implies B1</p> <p>May be seen (explicitly) in part (b). Do not allow equivalent e.g. <math>y^2 = 25x</math> unless <math>(y \Rightarrow) 5\sqrt{x}</math> seen in part (b)</p>								
<p>(b)</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="padding: 2px 10px;"><math>x</math></td> <td style="padding: 2px 10px;">36</td> <td style="padding: 2px 10px;">49</td> <td style="padding: 2px 10px;"><b>64</b></td> </tr> <tr> <td style="padding: 2px 10px;"><math>y</math></td> <td style="padding: 2px 10px;">30</td> <td style="padding: 2px 10px;"><b>35</b></td> <td style="padding: 2px 10px;">40</td> </tr> </table>	$x$	36	49	<b>64</b>	$y$	30	<b>35</b>	40	B2	<p>B1 for one correct value. FT from any non-linear</p>
$x$	36	49	<b>64</b>							
$y$	30	<b>35</b>	40							
<p>12. In either order: A and G (in either order) Condition: SAS OR 2 sides and <u>included</u> angle</p> <p>D and E (in either order) Condition: SSS OR 3 sides</p>	<p>B1 E1  B1 E1</p>	<p>E marks depend on B marks</p>								
<p>13. (a) <math>4 = 1 + 8t - 5t^2</math> or <math>1 + 8t - 5t^2 = 4</math> leading to <math>5t^2 - 8t + 3 = 0</math></p>	B1	<p>Must be convincing.</p>								
<p>13. (b) <math>(5t - 3)(t - 1) (=0)</math> <math>(t =) 3/5</math> AND 1</p>	<p>B2 B1</p>	<p>B1 for <math>(5t \dots 3)(t \dots 1)</math> Strict FT from 'their two brackets'. (Both solutions are required for this B1.)</p> <p><u>Using quadratic formula.</u> <math>(t =) \frac{8 \pm \sqrt{(-8)^2 - 4(5)(3)}}{2(5)} \quad M1</math></p> <p>Allow one error, in sign or substitution, but not in the formula. <math>t = \frac{8 \pm \sqrt{4}}{10} \quad A1</math> <math>t = 3/5</math> AND 1 <span style="float: right;">A1</span></p> <p><u>Using trial and improvement</u> Award B3 for a method leading to <u>both</u> solutions, namely <math>t = 3/5</math> AND <math>t = 1</math>, otherwise B0.</p>								

13. (c) Valid statement	E1	e.g. 2 different values of $t$ representing the ball on its way up and on its way down OR e.g. the ball reaches its highest point after $4/5$ s.  FT provided both solutions are positive.												
14. (a) $27$	B1													
14. (b) $\frac{1}{10}$	B1													
15. (a) $x = 0.2454545\dots$ and $100x = 24.54545\dots$ <u>with</u> an attempt to subtract  $243/990$ or $27/110$ or equivalent.	M1  A1	Or $10x$ and $1000x$ , or equivalent. Or a <u>complete</u> alternative method.  An answer of $24.3/99$ gains M1 only. ISW												
<u>Alternative method</u> $0.2 + 0.0454545\dots = 1/5 + 45/990$ or equivalent $243/990$ or $27/110$ or equivalent	M1 A1	ISW												
15. (b) $8 \times 5 + 8\sqrt{7} - 5 \times 3\sqrt{7} - 3(\sqrt{7})^2$ or equivalent  $= 19 - 7\sqrt{7}$	M1  A1	Mark final answer. If no marks awarded, SC1 for 3 of the 4 terms correct.												
16. (a) <table border="1" data-bbox="108 1126 571 1249"> <tr> <td><math>x</math></td> <td>-2</td> <td>-1</td> <td>0</td> <td>1</td> <td>2</td> </tr> <tr> <td><math>y</math></td> <td><math>\frac{1}{4}</math></td> <td><math>\frac{1}{2}</math></td> <td>1</td> <td>2</td> <td>4</td> </tr> </table> Suitable choice of <u>uniform</u> scales through the origin, $x$ from $-2$ to $2$ and $y$ from $0$ to $4$ , AND plotting at least 3 points correctly.  Joining with a <u>curve</u> .	$x$	-2	-1	0	1	2	$y$	$\frac{1}{4}$	$\frac{1}{2}$	1	2	4	B1  B1  C1	Any 3 correct pairs of coordinates (need not be for integer values of $x$ .) Must include one negative value of $x$ .  FT their evaluations of $y$ if shown (provided they do not produce a straight line). Must include one negative value of $x$ . Tolerance for accuracy $\pm \frac{1}{2}$ a small square.  CAO. Exponential curve which passes through $(-2, \frac{1}{4})$ , $(0, 1)$ and $(2, 4)$ . Must not intercept $x$ axis anywhere, including beyond the required range of $x$ values. Tolerance for accuracy $\pm \frac{1}{2}$ a small square.  If no table or evaluations of coordinates are given (for at least 3 pairs of values, including one negative value of $x$ ), then B1 B1 may be implied by C1 <u>or</u> if C0, B1 B1 may be implied by 3 correctly plotted points for $y = 2^x$ (including one negative value of $x$ ).
$x$	-2	-1	0	1	2									
$y$	$\frac{1}{4}$	$\frac{1}{2}$	1	2	4									



16. (b) Reading from their graph for $x = 1.4$ $(y \approx 2.6)$	B1	FT 'their <u>curve</u> '. (No FT for a straight line.) Tolerance for accuracy $\pm \frac{1}{2}$ a small square.
16. (c) Reading from their graph for $y = 1.4$ $(x \approx 0.5)$	B1	Accept an embedded answer. FT 'their <u>curve</u> '. (No FT for a straight line.) Must include all relevant readings if 'their graph' is not one-to-one. Tolerance for accuracy $\pm \frac{1}{2}$ a small square.
17. (a) Either $\frac{8}{12} \times \frac{7}{11}$ or $\frac{3}{12} \times \frac{2}{11}$ $\frac{8}{12} \times \frac{7}{11} + \frac{3}{12} \times \frac{2}{11}$ with no incorrect additional terms $\frac{62}{132}$ (=31/66)	B1 M1 A1	ISW. If no other marks awarded, SC1 for an answer of 73/144 (from working 'with replacement', without allowing for 2 books)
17. (b) $\frac{11}{12} \times \frac{10}{11} \times \frac{9}{10}$ or equivalent $\frac{990}{1320}$ (= 3/4) or equivalent	M1 A1	Or P(PPP) + 3 x P(PPK) + 3 x P(PKK) + P(KKK) (or an alternative full method) ISW  FT consistent use of 'their 12 x 11'.  If no other marks awarded, SC1 for an answer of 1331/1728 (from working 'with replacement') OR SC1 for this method and related answer, having omitted up to two (out of eight) products OR SC1 for $\frac{11}{12} \times \frac{10}{11} \times \frac{9}{10} \times \frac{1}{9} = \frac{990}{11880}$ (= 1/12) (for the 4 <sup>th</sup> prize being the book)
18. (a) 159° and 201° with no other values	B2	B1 for either angle. Check diagram. Penalise -1 for each extra value (beyond 2 attempts). Ignore extra (correct) values outside the required range.
18. (b) (i) Vertical enlargement upwards <u>and</u> downwards  Scale factor of 2	B1 B1	Mark clear intention. Must be the correct shape, i.e. a single cycle of a cosine <u>curve</u> , with x-intercepts at $x = 90^\circ$ and $x = 270^\circ$ , minimum at $x = 180^\circ$ , maxima at $x = 0$ and $x = 360^\circ$ .  Accept any clear indication. Must have correct x and y-intercepts, correct minimum and correct point for $x = 360^\circ$ .
18. (b) (ii) Vertical translation  Vertical -1	B1 B1	Mark clear intention. Must be the correct shape, i.e. a single cycle of a cosine <u>curve</u> , with x-intercepts at $x = 0^\circ$ and $x = 360^\circ$ , minimum at $x = 180^\circ$ , maxima at $x = 0$ and $x = 360^\circ$ .  Accept any clear indication. Must have correct x and y-intercepts, correct minimum and correct point for $x = 360^\circ$ .  Award SC1 for a fully labelled sketch of $y = \cos x + 1$ .