

# *GCSE*

## *Methods in Mathematics*

### *(Linked Pair Pilot)*

9365F

*Unit 2: Higher Tier*

*Mark scheme – Additional Guidance*

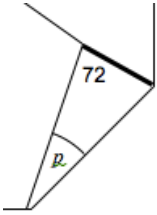
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<p><b>1</b></p>	<p>It is not necessary to multiply <math>23 \div 40</math> or their <math>(40 - 23) \div 40</math> by 100 to get M1 as many students may be familiar with a multiplier so know to just move the decimal point to get the percentage.</p> <p>It is necessary to multiply by 100 to get the follow through in the alternate scheme as the answer must be converted to a percentage.</p> <p>In the first scheme <math>23 \div 40 = 0.575</math> M1, <math>100 - 0.575 = 99.425</math> A0, A1ft as this shows the correct strategy.</p> <p>It is unlikely that if <math>40 - 23</math> is miscalculated but this must be seen to score. eg <math>27 \div 40</math> may imply that <math>40 - 23</math> is miscalculated but unless <math>40 - 23 = 27</math> is seen then it is M0.</p> <p>Third scheme is for taking 40 as 100% and breaking 40 up to get 23 or 17. This is a M1, M1dep scheme so no follow through.</p> <p>Fourth scheme is for scaling 40 to 100 and doing the same scaling for 23 or 17. This is a M1, M1 scheme where if the second M1 is awarded it implies the first but no follow through.</p>
<p><b>2</b></p>	<p>Allow <math>a^2 = \text{odd}</math> as <math>a</math> is given as odd in the question and/or <math>b^2 = \text{even}</math> as <math>b</math> is given as even in the question. Allow <math>a^2 + b^2 = \text{odd}</math> if both <math>a^2 = \text{odd}</math> and <math>b^2 = \text{even}</math> stated.</p>
<p><b>3</b></p>	<p>Mark each row independently.</p> <p>If a row is completely correct award B2. If one is wrong and 4 are right award B1. If two (or more) are wrong award B0.</p>
<p><b>4</b></p>	<p>Only the first 5 dps need be checked as it is impossible that if these are correct that the rest will be wrong.</p> <p>Common wrong answers:</p> <p>2.19010... rounding to 2.2 (not a problem as part (a) is GM)</p> <p>-0.44871... rounding to -0.4</p> <p>4.52099... rounding to 4.5</p>
<p><b>5 (a)</b></p>	<p>3 or 6 seen as tallies or similar. Allow B1</p> <p><math>3x</math> and/or <math>6x</math> B0</p>
<p><b>5b</b></p>	<p>If the equation is set up correctly and solved incorrectly then M1, A0, Q1 is awarded.</p> <p>ie <math>2x + 3 + x + 6 = 30</math>, <math>3x + 9 = 30</math>, <math>3x = 39</math>, <math>x = 13</math> is M1, A0, Q1</p> <p>Otherwise the wrong equation providing it includes both <math>x</math>, <math>2x</math> (or <math>3x</math>) and a 'sensible' combination of numbers from 3, 6 and/or 30 <b>must</b> be solved correctly for Q1</p> <p>Special case if <math>3x</math> or <math>6x</math> given for 3 or 6 and this is used to set up the equation then allow Q1 if equation set up and solved correctly, eg <math>3x</math> and <math>6x</math> given in (a), <math>x + 2x + 3x + 6x = 30</math>, <math>x = 2.5</math> is Q1.</p> <p>7 without an equation is Q0, M1, A1</p>

<p><b>6</b></p>	<p>The <math>x</math> coordinate is independent of any other working.</p> <p><math>y</math> coordinate must be 8 for full marks, but a <math>y</math> coordinate of 8 scores 3 if no working or no incorrect working seen.</p> <p><math>y</math> coordinate can be followed through from their base for a maximum of 2 marks. The height must be calculated properly and then 4 added.</p> <p>Working on diagram would be mid-point <math>AB</math> marked as (2, 4) and height marked as 4 for example.</p> <p>Grid lines may be drawn on diagram. If these show 10 divisions between A and B then allow the M1. Similarly if C is on the line <math>x = 2</math> allow B1. If 4 divisions seen between AB and C allow A1.</p> <p>Base = 8, height = <math>20 \div 8 \times 2 = 5</math>, Answer (2, 9) is B1, B0, M1, A1ft</p>
<p><b>8</b></p>	<p>Students are likely to confuse interior and exterior angles.</p> <p>This will lead to the correct answer. However if it is clear, either from working or marking on diagram that exterior and interior angles have been confused only allow SC1 for a correct answer of 27.</p> <p>If it is not clear and the calculations are correct and lead to an answer of 27 then award 3 marks.</p> <p>The follow through can only be awarded if the M1 is awarded, so at least one angle must be correct. Obviously the first A will not be awarded and the A1ft will be the difference between their angles. However, once again, if there is any confusion with exterior, interior angles do not award the follow through.</p> <p>One possible error is to join the 'triangle' and assume isosceles with the base angle as the exterior angle of the pentagon, so working will be <math>72^\circ</math> M1, <math>180 - (2 \times 72)</math> M0, 36 A0.</p>  <p>Interior pentagon = <math>540 \div 5 = 110</math>, Interior Octagon = 135, <math>135 - 110 = 25</math>, M1, A0, A1ft 75 and 45 marked on diagram as exterior angles, Answer 30. M1, A0, A1ft</p>
<p><b>9a</b></p>	<p>Check each row to see if correct or wrong. For example if the rows are C, B, A this is 1 correct (award B1). If the rows are B, C, A this is none correct (award B0). Ignore one repeat, as there is no reason why the student may think the equations are equivalent, so C, A, A would be B1 as two are correct. C, C, A would be B1 as 1 correct. A, C, C would be B0 as all wrong. If all three rows are the same letter, eg, A, A, A award B0.</p>
<p><b>10</b></p>	<p>See S scripts for exemplars. Minimum is 2 triangles that make a square.</p>

<p><b>13a</b></p>	<p>The M mark on scheme 1 is for seeing <math>x</math>, <math>5x</math> and <math>10</math> and an equals sign in any combination of signs. The A1 is for <math>4x = 10</math> (oe) only. The A1ft is for their equation if M awarded solved correctly with one error. Note that the correct equation solved with one error is M1, A0, A1ft. The wrong equation solved with no errors is M1, A0, A1ft, but the wrong equation solved incorrectly is M1, A0, A0ft as two errors.</p> <p><math>x + 10 = 5x</math>, <math>6x = 10</math>, <math>x = \frac{10}{6}</math> M1, A0, A1ft</p> <p><math>x - 10 = 5x</math>, <math>4x = -10</math>, <math>x = -2.5</math> is M1, A0, A1ft</p> <p><math>x - 10 = 5x</math>, <math>6x = -10</math>, <math>x = -1.66</math> is M1, A0, A0ft</p> <p><math>x - 10 = 5x</math>, <math>4x = 10</math>, <math>x = 2.5</math> is M1, A0, A0ft (from wrong work)</p> <p>The M mark on scheme 2 is for getting the <math>x</math> terms on one side of an equals sign and 2 on the other, with any combination of signs. A1 is for <math>\frac{4x}{5} = 2</math> (oe) only. The A1 is for their equation if M awarded solved correctly with one error. Note that the correct equation solved with one error is M1, A0, A1ft. The wrong equation solved with no errors is M1, A0, A1ft, but the wrong equation solved incorrectly is M1, A0, A0ft as two errors.</p> <p><math>\frac{x}{5} = x + 2</math>, <math>-\frac{4x}{5} = 2</math>, <math>x = -2.5</math> is M1, A0, A1ft</p> <p><math>\frac{x}{5} + x = 2</math>, <math>\frac{6}{5}x = 2</math>, <math>x = 1.66</math> is M1, A0, A0ft</p>
<p><b>13b</b></p>	<p><math>3(2y - 3) + 4(y - 4)</math>, <math>6y - 9 + 4y + 16 = 10y + 7 = 12</math>, <math>y = 0.5</math> M1, A0, M1, A1 ft</p> <p><math>3(2y - 3) + 4(y - 4)</math>, <math>6y - 9 + 4y - 16 = 10y - 25 = 12</math>, <math>y = 1.3</math> M1, A1, M1, A0ft</p> <p><math>4(2y - 3) + 3(y - 4)</math>, <math>8y - 12 + 3y - 12 = 11y - 24 = 12</math>, <math>y = 3.27</math> M0, A0, M1, A0</p> <p><math>3(2y - 3) + 4(y - 4)</math>, <math>6y - 9 + 4y - 16 = 10y - 25 = 2</math>, <math>y = 2.6</math> M1, A1, M0, A0 ft</p> <p><math>6y - 3 + 4y - 16 = 10y - 19 = 1</math>, <math>10y = 20</math>, <math>y = 2</math> M1, A0, M0, A0 ft</p> <p><math>6y - 9 + 4y - 4 = 10y - 13 = 12</math>, <math>10y = 1</math>, <math>y = 0.1</math> M1, A0, M1, A0 ft (2 errors)</p>
<p><b>15</b></p>	<p>Any alternative methods must be fully correct to get M2.</p> <p>M1 for sine rule, M2 for <math>x = \frac{15 \times \sin 90}{\sin 28}</math></p>
<p><b>16c</b></p>	<p>1.5 in (a) and 20 this is B1 ft.</p> <p>1.6 in (a) and 18.75 is B1ft</p> <p>2.5 in (a) and 12 is B1ft</p> <p>1.67 in (a) and 17.9 is B0 as answer not given to 2dp</p> <p>1.67 in (a) and 17.96 is B1ft as answer not given to 2dp</p> <p>1.67 in (a) and 18 is B1 as 18 is correct and the approximation is recovered.</p> <p>The calculation may not be seen so answer must be checked.</p>

<p><b>18b</b></p>	<p>Cyclic or 'quadrilateral that touches sides of circle' must be mentioned.  Opposite must be mentioned.  Allow poor communication such as 'Opposite angles in a cyclic quad = 180'  180 is not necessary if 40 given as answer as it is implied so 40 seen and 'Opposite angles of cyclic quad' is OK for Q mark.</p>
<p><b>18c</b></p>	<p>Mark answer lines first. If blank then look at diagram and script. Angles must be clearly marked or stated so 110 seen in script will not score unless it says <math>y = 110</math></p>
<p><b>19</b></p>	<p>The lengths and angle were given to give the chance to score more marks. Writing 6 by <i>OR</i> on diagram is sufficient for the statement and reason that <math>OR = OP</math>. Similarly for 8 by <i>OA</i>. If diagram not labelled then the reason must be stated in script. Writing 30 in angle does not score unless it is justified by the 60 and 90 or 120 and 90. Reason is SAS or clearly stated in words. 'Two sides and an angle' is not enough, but 'two sides and angle between them' is OK.</p>
<p><b>21</b></p>	<p>There are two parts to this. First: Find diameter by Cosine rule. Second: Find semi-circumference of circle and add on 17 for perimeter. There is no other way to get the diameter except by cosine rule, so the M for the semi-circumference is Mdep. In other words do not follow through unless the first M awarded. Most common error will be to miscalculate the length by working out <math>(a^2 + b^2 - 2ab)\cos C</math>. This is allowed for in scheme. There is one special case, where Pythagoras is used to get the diameter. This is not a method mark. It is 2 marks or nothing.</p> <p>(diameter =) [12, 12.1] is 3 marks  [18.9, 19] is 4 marks</p>
<p><b>22</b></p>	<p>Some students will do a 'day by day' approach, subtracting <math>\frac{1}{9}</math> each day. The first mark is an M mark so they must show the correct method of subtracting <math>\frac{1}{9}</math> for at least 4 days to get this. The second mark is also an M mark so they must show the correct method for all 6 days to get this mark. The answer of 0.49... (oe) must be seen. It is not necessary to show this is less than <math>\frac{1}{2}</math>.</p>
<p><b>23</b></p>	<p>A lot of students are using 13.5 as the height of a cone. This is M0.  <math>384\pi</math> or [1190.4, 1206.6] seen is 1 mark  <math>6\pi</math> or [18.6, 18.855] is 1 mark (or 2 if <math>384\pi</math> or [1190.4, 1206.6] already seen)  <math>378\pi</math> or [1170, 1190] is 3 marks</p>