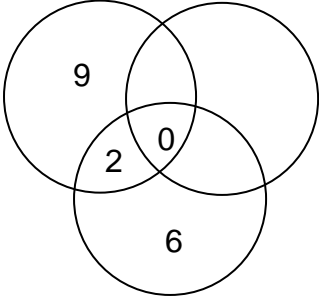


<b>MATHEMATICS 2<sup>nd</sup> SAMs 2017</b> <b>Unit 2 (Calculator allowed) Higher Tier</b>	<b>Mark</b>	<b>MARK SCHEME</b> <b>Comments ( Page 1)</b>																																													
<p>1. Correct construction of 60°.</p> <p>Correct construction of 90°.</p> <p>Correct bisector of 90°.</p>	<p>B2</p> <p>B2</p> <p>B1</p> <p>5</p>	<p>With sight of accurate 'method arcs'. B1 for sight of 'method arcs' but not drawn accurately.</p> <p>With sight of accurate 'method arcs'. B1 for sight of 'method arcs' but not drawn accurately.</p> <p>With sight of accurate 'method arcs'. FT 'their 90°' Penalise -1 if angles drawn at incorrect positions or if triangle not completed.</p>																																													
<p>2. TRUE TRUE FALSE FALSE</p>	<p>B2</p> <p>2</p>	<p>B1 for 3 correct.</p>																																													
<p>3.</p> <p>One correct evaluation <math>2 \leq x \leq 3</math> 2 correct evaluations <math>2.65 \leq x \leq 2.85</math>, one <math>&lt; 0</math> and one <math>&gt; 0</math>. 2 correct evaluations <math>2.65 \leq x \leq 2.75</math>, one <math>&lt; 0</math> and one <math>&gt; 0</math>.</p> <p>(<math>x =</math>) 2.7</p>	<p>B1</p> <p>B1</p> <p>M1</p> <p>A1</p> <p>4</p>	<p><i>Correct evaluation regarded as enough to identify if negative or positive. If evaluations not seen accept 'too high' or 'too low'.</i></p> <table border="0"> <tr> <td><math>x</math></td> <td><math>x^3 - 6x - 4</math></td> <td></td> </tr> <tr> <td>2</td> <td>-8</td> <td></td> </tr> <tr> <td>2.1</td> <td>-7.339</td> <td></td> </tr> <tr> <td>2.2</td> <td>-6.552</td> <td></td> </tr> <tr> <td>2.3</td> <td>-5.633</td> <td></td> </tr> <tr> <td>2.4</td> <td>-4.576</td> <td></td> </tr> <tr> <td>2.5</td> <td>-3.375</td> <td></td> </tr> <tr> <td>2.6</td> <td>-2.024</td> <td></td> </tr> <tr> <td>2.55</td> <td></td> <td>-2.718...</td> </tr> <tr> <td>2.7</td> <td>-0.517</td> <td></td> </tr> <tr> <td>2.65</td> <td></td> <td>-1.290...</td> </tr> <tr> <td>2.8</td> <td>1.152</td> <td></td> </tr> <tr> <td>2.75</td> <td></td> <td>0.296...</td> </tr> <tr> <td>2.9</td> <td>2.989</td> <td></td> </tr> <tr> <td>3</td> <td>5</td> <td></td> </tr> </table>	$x$	$x^3 - 6x - 4$		2	-8		2.1	-7.339		2.2	-6.552		2.3	-5.633		2.4	-4.576		2.5	-3.375		2.6	-2.024		2.55		-2.718...	2.7	-0.517		2.65		-1.290...	2.8	1.152		2.75		0.296...	2.9	2.989		3	5	
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<p>4.(a)</p>  <p>2 in correct position. 6 in correct position. 9 in correct position.</p> <p>(b) 6</p> <p>(c) <math>\frac{17}{45}</math></p>	<p>B1</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>B2</p> <p>6</p>	<p>FT 8 – 'their 2'.</p> <p>FT 17 – 'their 2' – 'their 6'.</p> <p>FT 'their total' for planning. B1 for a correct numerator only in a fraction <math>&lt; 1</math>. B1 for a denominator of 45 in a fraction <math>&lt; 1</math>.</p>																																													

MATHEMATICS 2 <sup>nd</sup> SAMs 2017 Unit 2 (Calculator allowed) Higher Tier	Mark	MARK SCHEME Comments ( Page 2)
5. Correct statement of Pythagoras' Theorem $PR^2 = 18 \cdot 4^2 - 12 \cdot 5^2$ $= 182 \cdot 31$ (PR=) 13.5(cm)	M1 A1 A1  3	Also M1 for $18 \cdot 4^2 = PR^2 + 12 \cdot 5^2$ . Or for sight of $\sqrt{182 \cdot 31}$
6. Sight of $2a + 3c = (\pounds)71.5(0)$ AND $3a + 4c = (\pounds)101$  or equivalent Correct method to eliminate one variable.  First variable found $a = (\pounds)17$ or $c = (\pounds)12.5(0)$ Substitute to find 2 <sup>nd</sup> variable Second variable found $c = (\pounds)12.5(0)$ or $a = (\pounds)17$  (4 adults and 2 children pay) $\pounds 93$	B1  M1  A1 M1 A1  A1  6	Accept their choice of variables for a and c.  FT 'their equations' if of equivalent difficulty. Allow 1 error in one term, not one with equal coefficients.  FT 'their 1 <sup>st</sup> variable'.  FT their values if both M marks gained. '£' required.
7.(a) $(x-7)(x+3)$ $x = 7$ AND $x = -3$  (b) $\frac{2x-14}{(8)} + \frac{2x+5}{(8)} = \frac{4}{(8)}$ or equivalent. $4x-9 = 4$ or equivalent. $x = \frac{13}{4}$ or $3\frac{1}{4}$ or equivalent.	B2 B1  B2  B1 B1  7	B1 for $(x \dots 7)(x \dots 3)$ . Strict FT from their brackets.  B1 for 1 error. FT until 2 <sup>nd</sup> error.  Mark final answer.
8. $\hat{BDC} = 36^\circ$ Angles in the same segment are equal. $BC = 5 \cdot 1 \times \tan 36$ Angle subtended at the circumference by a semicircle is $90^\circ$ . $BC = 3 \cdot 7(\dots)(\text{cm})$	B1 E1 M1 E1  A1  5	May be seen on diagram. Accept unambiguous statement of this fact. Accept $BC / 5 \cdot 1 = \tan 36$ . Accept unambiguous statement of this fact.
9. (Least possible distance =) 399.75 (m) (Greatest possible distance =) 400.25 (m) (Least possible time =) 73.5 (seconds) (Greatest possible time =) 74.5 (seconds)  (Least possible av. Speed =) $\frac{399.75}{74.5}$ OR (Greatest possible av. Speed =) $\frac{400.25}{73.5}$  $= 5.36(5\dots)$ AND $5.44(55\dots)$ (m/s)  Organisation and communication Accuracy of writing	B2  M1  A2  OC1 W1  7	All four correct values. B1 for any 2 correct values.  One correct use of formula. FT their values.  2 <b>distinct</b> values.

<b>MATHEMATICS 2<sup>nd</sup> SAMs 2017</b> <b>Unit 2 (Calculator allowed) Higher Tier</b>	<b>Mark</b>	<b>MARK SCHEME</b> <b>Comments ( Page 3)</b>									
<p>10. (a) <math>x = 0.49191\dots</math> and <math>100x = 49.19191\dots</math> with an attempt to subtract, OR equivalent (e.g. <math>1000x - 10x</math>)</p> $\frac{487}{990}$ <p>(b) False, AND a correct reason e.g. 'a needs to be a cube number for it to yield an integer' or a counter-example e.g. <math>6^{\frac{2}{3}} = \sqrt[3]{36}</math> and 36 is not a cube number.</p> <p>(c) (i) <math>10\sqrt{2}</math> (ii) <math>4\sqrt{5}</math></p>	<p>M1</p> <p>A1</p> <p>B1</p> <p>B1 B1</p> <p>5</p>	<p>OR 48.7 / 99</p> <p>Mark final answer.</p>									
<p>11. <math>\frac{40}{260} \times</math> the number of employees in any category.</p> <table border="1" data-bbox="150 869 608 965"> <thead> <tr> <th></th> <th>Male</th> <th>Female</th> </tr> </thead> <tbody> <tr> <td>Full-time</td> <td>19</td> <td>5</td> </tr> <tr> <td>Part-time</td> <td>3</td> <td>13</td> </tr> </tbody> </table>		Male	Female	Full-time	19	5	Part-time	3	13	<p>M1</p> <p>A2</p> <p>3</p>	<p>A1 for any 2 or 3 correct answers.</p>
	Male	Female									
Full-time	19	5									
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<p>12. (a) Tangent drawn Idea of increase in <math>y</math> / increase in <math>x</math> Gradient from a reasonable tangent <math>m/s^2</math> OR <math>ms^{-2}</math></p> <p>(b) Split into 6 areas and attempt to sum (Area =) <math>\frac{1}{2} \times 10(0+2 \times 10+2 \times 30+2 \times 32+2 \times 33+2 \times 39+40)</math> <math>= 1640(m)</math></p>	<p>S1</p> <p>M1</p> <p>A1</p> <p>U1</p> <p>M1</p> <p>M1</p> <p>A1</p> <p>7</p>	<p>Or equivalent. Award for up to 1 error in reading scale. CAO.</p>									
<p>13. (<math>l^2 = 10^2 + 5^2</math>) <math>l^2 = 125</math> OR <math>(l =) \sqrt{125}</math> <math>(l =) 11.1(803\dots)</math> or <math>11.2</math> (Surface area =) <math>\pi \times 5 \times 11.1(803\dots) + 2\pi \times 5 \times 8 + \pi \times 5^2</math> <math>= 505</math> to <math>506</math> (<math>cm^2</math>)</p>	<p>M1</p> <p>A1</p> <p>A1</p> <p>M2</p> <p>A1</p> <p>6</p>	<p>FT 'their l'. M1 for any 2 of the 3 terms.</p>									
<p>14. (a) <math>3(x + 1) - 5(2x - 1)</math> as numerator AND <math>(2x - 1)(x + 4)</math> as denominator. OR multiply throughout by <math>(2x - 1)</math> and <math>(x + 4)</math> <math>3(x + 4) - 5(2x - 1) = 6(2x - 1)(x + 4)</math> <math>0 = 12x^2 + 49x - 41</math></p> <p>(b) <math>x = \frac{-49 \pm \sqrt{49^2 - 4 \times 12 \times (-41)}}{2 \times 12}</math></p> $x = \frac{-49 \pm \sqrt{4369}}{24}$ <p><math>x = 0.71</math> and <math>x = -4.80</math></p>	<p>M2</p> <p>A1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>A1</p> <p>7</p>	<p>Brackets required or implied later. M1 for either correct numerator or denominator, or multiply throughout with 1 error.</p> <p>Convincing i.e. need to see at least <math>12x^2 + 42x - 24</math> Allow one error, in sign or substitution, but not in the formula.</p> <p>CAO.</p> <p>CAO.</p>									

<b>MATHEMATICS 2<sup>nd</sup> SAMs 2017</b> <b>Unit 2 (Calculator allowed) Higher Tier</b>	<b>Mark</b>	<b>MARK SCHEME</b> <b>Comments ( Page 4)</b>
15. Use of $\frac{1}{2}ab\sin C$ followed by cosine rule  $24 \cdot 25 = \frac{1}{2} \times 12 \cdot 7 \times AD \times \sin 132^\circ$ $AD = (2 \times 24 \cdot 25) / (12 \cdot 7 \times \sin 132^\circ)$ $AD = 5 \cdot 13(883\dots)$ or $5 \cdot 14$ (cm) $DB^2 = 12 \cdot 7^2 + AD^2 - 2 \times 12 \cdot 7 \times AD \times \cos 132^\circ$ $DB^2 = 275 \cdot 036\dots$ $DB = 16 \cdot 5(842\dots)$ or $16 \cdot 6$ (cm)	S1  M1 m1 A1 M1 A1 A1          7	FT provided M1 awarded.  <i>Alternative solution (using a new point E which is vertically above D):</i> $DE = \text{area} / 12 \cdot 7 = 3 \cdot 819(\text{cm})$ <span style="float: right;">S1</span> $AE = DE / \tan 48^\circ = 3 \cdot 439(\text{cm})$ <span style="float: right;">M1</span> $BE = AE + AB = 16 \cdot 139(\text{cm})$ <span style="float: right;">m1</span> <i>Using Pythagoras, <math>DE^2 + BE^2 =</math></i> <span style="float: right;">M1</span> $275 \cdot 05$ <span style="float: right;">A1</span> $BD = 16 \cdot 5(8\dots)$ or $16 \cdot 6$ (cm) <span style="float: right;">A1</span>

