

EDUQAS GCSE MATHEMATICS

AUTUMN 2022 MARK SCHEME

Component 2: Higher Tier	Mark	Comment
1. *(a)(i) $\frac{5}{12}$	B1	ISW
1.(a)(ii) $\frac{18072}{12} \times 7$ (£)10542	M1 A1	FT 'their 2 + 3 + 7' from (a)(i) provided > 10
1.(b) $\frac{80}{32} (\times 100)$ or $2.5 (\times 100)$ 250(%)	M1 A1	Mark final answer If no marks, award SC1 for an answer of 150(%) (using a profit of £48)
	(5)	
2. *(a) $(650 \times 8 + 750 \times 7 + 850 \times 4 + 950 \times 11)$ $\div 30$ 810 (grams)	M1 m1 A1	(= 24300)
2.(b) Valid comment e.g. 'Her answer will be an underestimate.' 'She is using the lowest values so the mean will be too small'.	E1	Allow answers that state that the calculated mean will be smaller or indicate that the lowest values do not represent the groups, e.g. 'Her method will give a smaller mean.' 'Because these values do not represent the entire range.' 'Because she ignored the distribution in each interval.' 'Because she is using the minimum masses making at an unfair estimate.' Do not allow e.g. 'She has used the smallest value in each group.' 'Because these values are the lowest bounds.' 'Because it is not as accurate as the midpoints.' 'It is better to use the midpoints'
	(4)	

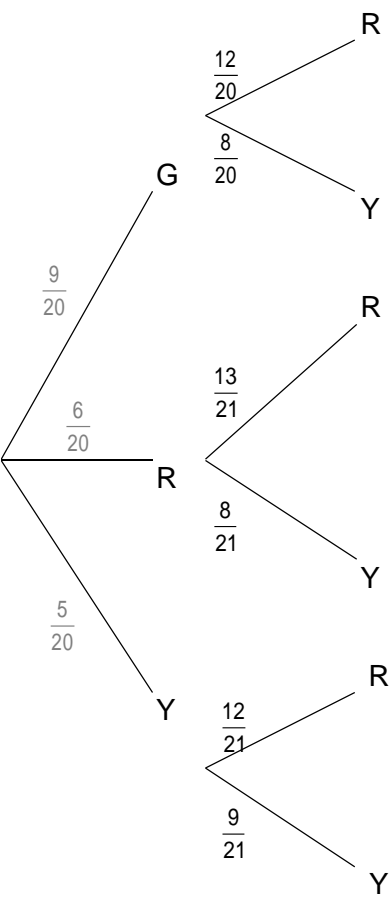
<p>3.*(a) Valid criticism e.g. 'There are no points above the line.' 'There should be some points above and below the line.' 'It does not follow the trend of the data.'</p>	<p>E1</p>	<p>Allow e.g. 'She has just joined the first point to the last.' 'It is not through the middle of the points.' 'It is not in between all the points.'</p> <p>Do not allow e.g. 'The line is in the wrong place.' 'It does not go through many points.'</p>
<p>3.(b) No indicated and valid comment e.g. 'Correlation does not imply causation.' or 'There could be another reason such as owning a dog for example would mean you took more exercise.'</p>	<p>E1</p>	<p>Allow e.g. 'There is no relationship between them, it is just a coincidence.' 'Owning a pet has nothing to do with going to the doctors.'</p>
(2)		
<p>4.* $5000 \times 1.02^5 \times 1.013^4$ oe, si</p> <p>(£) 5813.11... or £5813.10 or (£)5813</p>	<p>M3</p> <p>A1</p>	<p>Method for M3 or M2 may be seen in stages</p> <p>M2 for use of $\dots \times 1.02^5$ or $\dots \times 1.013^4$ oe Note: $5000 \times 1.02^5 = 5520.40\dots$ and $5000 \times 1.013^4 = 5265.11\dots$</p> <p>M1 for use of $\times 1.02$ or $\dots \times 1.013$ oe Note: $5000 \times 1.02 (= 5100)$ or $5000 \times 1.013 (= 5065)$</p> <p>CAO A1 only from fully correct working.</p>
(4)		
<p>5.*(a) 7 000 000 indicated</p>	<p>B1</p>	
<p>5.(b) $\frac{1}{2} \times (79 + 62) \times 30$ oe $\pi(30 \div 2)^2$</p> <p>$(\frac{1}{2} \times (79 + 62) \times 30 - \pi \times 15^2) \div (\pi \times 15^2)$</p> <p>OR $\frac{1}{2} \times (79 + 62) \times 30 \div (\pi \times 15^2) - 1$</p> <p>(k =) 1.9(921...) si</p> <p>(k =) 2</p>	<p>B1</p> <p>B1</p> <p>B1</p> <p>M2</p> <p>A1</p> <p>B1</p>	<p>(= 2115)</p> <p>(= 706.858...)</p> <p>dep on at least B1 awarded; FT 'their area of circle' or 'their area of trapezium' for M2 or M1 (= $(2115 - 225\pi) \div 225\pi$)</p> <p>Award M1 for one of the following:</p> <ul style="list-style-type: none"> • $\frac{1}{2} \times (79 + 62) \times 30 - \pi \times 15^2$. (= 1408.1..) • $\frac{1}{2} \times (79 + 62) \times 30 \div (\pi \times 15^2)$. (= 2.99..) • $(706.9 : 2115) = 1 : 2.9(9..)$ or $1 : 3$ <p>CAO</p> <p>FT 'their 1.99...' rounded to 1 sig fig, providing at least M1 previously awarded and a ratio obtained (not for rounding an area). An answer of (k =) 2 implies the previous A1 if no incorrect working seen e.g. $706.9 : 1408 = 1 : 2$ Note: unsupported answers of 1:2 or k = 2 or are awarded zero marks</p>
(7)		

<p>6.*(a) $5x - 2x = 6 - 4$ or $3x = 2$ oe $(x =) \frac{2}{3}$, ISW</p>	<p>B1 B1</p>	<p>Allow 0.67 or 0.666 but not 0.66 FT from $ax = 2$, $a \neq 1$ or $3x = b$ accept $\frac{2}{a}$ or $\frac{b}{3}$ but if on FT either simplifies to an integer the answer must be given as an integer. Correct answer implies first B1 unless incorrect working seen. Maximum of 1 mark if not fully correct</p>
<p>6.(b) $4x > 17 + 3$ oe $x > 5$</p>	<p>M1 A1</p>	<p>Mark final answer; no marks for use of "=", unless finally replaced to give $x > 5$ then award M1 A1.</p>
<p>6.(c) Method to eliminate an unknown e.g. equal coefficients and subtraction or rearranges one equation and substitutes into the other Finds one unknown Finds the other unknown</p>	<p>M1 A1 A1</p>	<p>No marks for T&I; no marks for an unsupported answer. Allow one error in one term, not in the equated coefficients if appropriate CAO; $x = 2$, $y = -3$ FT 'their x' or 'their y' used in one of their equations</p>
<p>(7)</p>		

<p>7.* Uses $EC = 6$ oe correctly in a trigonometric statement</p> <p>$(BC =) \frac{6}{\cos 35}$ or $\frac{6}{\sin (90-35)}$</p> <p>$(BC =) 7.3(246\dots)$ si</p> <p>(perimeter =) $4 \times 7.3(246\dots)$ si</p> <p>(perimeter =) 29.2(...) or 29.3 or 29 (cm)</p>	<p>S1</p> <p>M2</p> <p>A1</p> <p>M1</p> <p>A1</p>	<p>Allow equivalent complete methods for M2 or M1</p> <p>M1 for $\cos 35 = \frac{6}{BC}$ or $\sin(90 - 35) = \frac{6}{BC}$ oe</p> <p>May be implied by a correct expression for the perimeter e.g $\frac{24}{\cos 35}$ or $\frac{24}{\sin 55}$ oe</p> <p>FT 'their derived BC' providing S1 previously awarded and their $BC > 6$</p> <p>FT</p>														
(6)																
<p>8.(a)</p> <table border="1" data-bbox="180 712 699 790"> <tbody> <tr> <td>t</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> </tr> <tr> <td>h</td> <td>12</td> <td>18</td> <td>18</td> <td>12</td> <td>0</td> <td>-18</td> </tr> </tbody> </table>	t	0	1	2	3	4	5	h	12	18	18	12	0	-18	<p>B2</p>	<p>B1 for any two correct</p>
t	0	1	2	3	4	5										
h	12	18	18	12	0	-18										
<p>8.(b)</p> <p>All 6 correct points plotted correctly and joined with a smooth curve</p>	<p>B2</p>	<p>Mark intent</p> <p>B1 for a smooth curve at least through 4 correct pairs of coordinates or for all of their 6 pairs of coordinates plotted correctly</p> <p>Allow 2 marks here if curve correct even if there is a slip in their table</p>														
<p>8.(c)(i)</p> <p>12 (metres)</p>	<p>B1</p>	<p>FT 'their h' when $t = 0$</p>														
<p>8.(c)(ii)</p> <p>4 (seconds)</p>	<p>B1</p>															
<p>8.(c)(iii)</p> <p>1.5 (seconds)</p>	<p>B1</p>															
<p>8.(c)(iv)</p> <p>18.75 (metres)</p>	<p>B1</p>	<p>Allow 18.5 to 19 inclusive (from their graph)</p>														
(8)																

<p>9. (Radius of cylinder =) 3 (cm) si (Number of cylinders in crate =) 80 $\pi \times 3^2 \times 32$ $\times 0.961$ $\times 80$ $= 69\,552 \text{ to } 69\,569 \text{ (g)}$ No indicated (with sight of 69() kg or 70 000 g)</p>	<p>B1 B1 M1 M1 M1 A1 A1</p>	<p>Multiplications can take place in any order May be implied by e.g. $d = 6$ May be implied in later working (288π or $904.7(7..)$ to 904.9 cm^3) (869.4 to $869.6(0\dots)$ g) FT 'their derived volume' providing it is a multiple of π. May use $0.000\,961 \text{ (kg/cm}^3\text{)}$; allow multiplication by figs 961 if a unit conversion error FT 'their 80' \times 'their derived volume or mass' CAO FT 'their 69 552 to 69 569 (g)' providing at least M2 previously awarded and no incorrect conversion to kg seen</p>
<p><i>Alternative method</i> (Radius of cylinder =) 3 (cm) si (Number of cylinders in crate =) 80 $\pi \times 3^2 \times 32$ $\times 0.961$ $= 869.5 \text{ to } 869.7\text{(g)}$ $70\,000 \div 80 (= 875 \text{ (g)})$ No indicated (with sight of 869() g and 875 g)</p>	<p>B1 B1 M1 M1 A1 M1 A1</p>	<p><i>May be implied by e.g. $d = 6$</i> <i>May be implied in later working</i> (288π or $904.7(7..)$ to 904.9 cm^3) (869.4 to $869.6(0\dots)$ g) FT 'their derived volume' providing it is a multiple of π. May use $0.000\,961 \text{ (kg/cm}^3\text{)}$; allow multiplication by figs 961 if a unit conversion error FT 'their $6 \div 2$' and possibly figs 961 <i>Allow e.g. 870 if correct working seen</i> M1 A1 FT 'their 869.5 to 869.7(g)' or 'their 870' providing at least M2 previously awarded</p>
<p>10. ($1 - 0.198$) \times ($1 - 0.065$) oe, si 0.74987 oe, si ($1 - 0.74987$) \times 100 oe, si 25.013 (%)</p>	<p>M1 A1 M1 A1</p>	<p>0.802×0.935 Allow one error in subtractions. CAO; allow 75% following full and correct working FT 'their derived 0.74987' providing < 1 and $\neq 0.802$ or 0.935; allow for sight of $1 - 0.74987$ or 0.25013 FT ($1 -$ 'their 0.74987') \times 100 Allow 25% following full and correct working</p>
	(7)	
	(4)	

<p>11. (a) Correct box plot with: Median at 19.4 Lower quartile at 16.8 Upper quartile at 21.0 Left whisker to 15.2 Right whisker to 23.2</p>	B3	<p>B1 for UQ = 21(.0) si; may not be in a box plot B1 for LQ, Median, UQ positioned correctly in a box plot, B1 for correct whiskers</p>																																																												
<p>11.(b)(i) Correct indicated and valid explanation e.g. 'The median for group B is lower.' or 'The median (for group A is 19.4 and) for group B is 18.8.'</p>	E1																																																													
<p>11.(b)(ii) Not correct indicated and valid explanation e.g. 'The lower quartile for B is more than 17 but the lower quartile for A is less than 17.'</p>	E1	<p>Allow: Not correct and 'Group A had a lower quartile less than 17'</p>																																																												
	(5)																																																													
<p>12.</p> <p>One correct evaluation with $1 \leq x \leq 2$</p> <p>Two correct evaluations with $1.55 \leq x \leq 1.75$ and one > 0, one < 0 si</p> <p>Two correct evaluations with $1.65 \leq x \leq 1.75$ and one > 0, one < 0 si</p> <p>1.7</p>	<p>B1</p> <p>B1</p> <p>M1</p> <p>A1</p> <p>(4)</p>	<p>Correct evaluation enough to imply > 0 or < 0; If evaluations not seen then may be implied by e.g, 'too big' or 'too small'; Mark solving $2x^3 + x^2 = 12$ equivalently</p> <table border="1" data-bbox="820 1167 1382 1671"> <thead> <tr> <th>x</th> <th>$2x^3 + x^2 - 12$</th> <th>or</th> <th>$2x^3 + x^2$</th> </tr> </thead> <tbody> <tr><td>1</td><td>-9</td><td></td><td>3</td></tr> <tr><td>1.1</td><td>-8.128</td><td></td><td>3.872</td></tr> <tr><td>1.2</td><td>-7.104</td><td></td><td>4.896</td></tr> <tr><td>1.3</td><td>-5.916</td><td></td><td>6.084</td></tr> <tr><td>1.4</td><td>-4.552</td><td></td><td>7.448</td></tr> <tr><td>1.5</td><td>-3</td><td></td><td>9</td></tr> <tr><td>1.55</td><td>-2.149...</td><td></td><td>9.850...</td></tr> <tr><td>1.6</td><td>-1.248</td><td></td><td>10.752</td></tr> <tr><td>1.65</td><td>-0.293...</td><td></td><td>11.706...</td></tr> <tr><td>1.7</td><td>0.716</td><td></td><td>12.716</td></tr> <tr><td>1.75</td><td>1.781...</td><td></td><td>13.781...</td></tr> <tr><td>1.8</td><td>2.904</td><td></td><td>14.904</td></tr> <tr><td>1.9</td><td>5.328</td><td></td><td>17.328</td></tr> <tr><td>2</td><td>8</td><td></td><td>20</td></tr> </tbody> </table> <p>If no marks, award SC2 for a complete method with a final answer of 1.1 from $(2x)^3 + x^2 - 12 = 0$ or $(2x)^3 + x^2 = 12$</p>	x	$2x^3 + x^2 - 12$	or	$2x^3 + x^2$	1	-9		3	1.1	-8.128		3.872	1.2	-7.104		4.896	1.3	-5.916		6.084	1.4	-4.552		7.448	1.5	-3		9	1.55	-2.149...		9.850...	1.6	-1.248		10.752	1.65	-0.293...		11.706...	1.7	0.716		12.716	1.75	1.781...		13.781...	1.8	2.904		14.904	1.9	5.328		17.328	2	8		20
x	$2x^3 + x^2 - 12$	or	$2x^3 + x^2$																																																											
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13.(a) 2651.25 (mm)	B1	
13.(b) Max length + max length attempted 2.855 + 1.905 OR 2.85 + 1.90 + 0.01 4.76 (m)	S1 M1 A1	Allow for a + b where $2.85 < a \leq 2.855$ and $1.90 < b \leq 1.905$. May be in cm. May be in cm; implies S1 CAO
(4)		
14.(a) Correct tree diagram e.g. 	B3	B1 for each pair of branches correct Allow equivalent fractions in all cases.
14.(b) $\left(\frac{6}{20} \times \frac{13}{21}\right) + \left(\frac{5}{20} \times \frac{9}{21}\right)$ oe $\frac{123}{420}$ or $\frac{41}{140}$ oe, ISW	M2 A1	Check tree diagram FT 'their probabilities' for M2 or M1, providing at least B1 awarded in (a) M1 for sight of one correct product FT 'their tree diagram'
(6)		

<p>15.(a)</p> <p>$2x(3x+2)+4\times 2$ or $2(2x+4)+3x(2x)$ or $2\times 4+2x\times 2+2x\times 3x$</p> <p>$6x^2+4x+8=10$ or better</p> <p>$6x^2+4x-2=0$ leading to $3x^2+2x-1=0$</p>	<p>B1</p> <p>M1</p> <p>A1</p>	
<p>15.(b)</p> <p>$(3x-1)(x+1)=0$</p> <p>$x = \frac{1}{3}$</p> <p>Correct perimeter calculation or expression e.g. $\frac{2}{3}+4+1+2+\frac{2}{3}+1+4+2$ oe or $2x+4+3x+2+2x+3x+4+2$ or $10x+12$ oe $15\frac{1}{3}$ (m) oe</p>	<p>M2</p> <p>A1</p> <p>M1</p> <p>A1</p>	<p>The work for M2 A1 may be seen in (a). Allow the marks if this is the case.</p> <p>Allow '= 0' to be omitted</p> <p>If not M2, award M1 for $(3x...1)(x...1)=0$</p> <p>Strict FT from 'their pair of brackets' provided equivalent level of difficulty, with at least one answer a positive fraction; ignore any negative solution if stated</p> <p>FT 'their x' providing at least M1 previously awarded and $x > 0$. Also, if M0 previously awarded, allow the use of $x = \frac{1}{3}$ (from calculator use) for this M1 and possible A1.</p> <p>FT</p>
<p><i>Alternative method:</i></p> <p>$(x =) \frac{-2 \pm \sqrt{2^2 - 4(3)(-1)}}{2(3)}$</p> <p>$(x =) \frac{-2 \pm \sqrt{16}}{6}$</p> <p>$x = \frac{1}{3}$</p> <p>Correct perimeter calculation or expression e.g. $\frac{2}{3}+4+1+2+\frac{2}{3}+1+4+2$ oe or $2x+4+3x+2+2x+3x+4+2$ or $10x+12$ oe</p> <p>$15\frac{1}{3}$ (m) oe</p>	<p>M1</p> <p>m1</p> <p>A1</p> <p>M1</p> <p>A1</p>	<p>The work for M2 A1 may be seen in (a). Allow the marks if this is the case.</p> <p>Substitution into the formula must be seen for M1, otherwise award M0 M0 A0.</p> <p>Can be implied from at least one correct value of x evaluated.</p> <p>ignore any negative solution if stated</p> <p>FT 'their x' providing M1 previously awarded and $x > 0$ or allow $x = \frac{1}{3}$ without working.</p> <p>FT</p>
	<p>(8)</p>	

16.(a) $a + \frac{1}{2}c$	B1	
16.(b) $\frac{1}{2}a + \frac{1}{4}c$ or $\frac{1}{2}(a + \frac{1}{2}c)$	B1	FT 'their $a + \frac{1}{2}c$ ' from (a)
16.(c) $\frac{1}{2}a - \frac{3}{4}c$	B2	FT 'their OE ' B1 for $-c + \frac{1}{2}a + \frac{1}{4}c$ oe
	(4)	
17. $\sqrt{56^2 + 33^2 + 72^2}$ or $\sqrt{56^2 + 33^2} (= 65)$ and $\sqrt{65^2 + 72^2}$ or $\sqrt{72^2 + 56^2} (= \sqrt{8320} = 8\sqrt{130})$ and $\sqrt{8320 + 33^2}$ or $\sqrt{72^2 + 33^2} (= \sqrt{6273} = 3\sqrt{697})$ and $\sqrt{6273 + 56^2}$ 97 (cm)	M2	M1 for $DF^2 = 56^2 + 33^2 + 72^2$ OR for one correct application of Pythagoras in 2D e.g. $\sqrt{56^2 + 33^2}$ or $\sqrt{72^2 + 56^2}$ or $\sqrt{72^2 + 33^2}$; implied by finding e.g. $DB = 65$
	A1	Allow 96.98 to 97 from earlier rounding
	(3)	
18.(a)(i) Reflection in y -axis	B1	Ignore coordinates for this mark; graph must be in 1st quadrant, starting at origin and ending at a point on the x -axis
Correct coordinates seen or scale marked	B1	$A(3, 0)$ and $B(1, 1)$
18.(a)(ii) Translation through $\begin{pmatrix} 0 \\ k \end{pmatrix}$ where $k > 0$	B1	Ignore coordinates for this mark; graph must be in 2nd quadrant, but mark intent for the end points to have the same y -coordinate
Correct coordinates seen or scale marked	B1	$A(-3, 2)$ and $B(-1, 3)$
18.(b) $C(17, 0)$	B1	Allow for sight of $x = 17$ provided $y = 0$ is not contradicted; may be seen on diagram Do not allow for 17 alone or $c = 17$
	(5)	

<p>19.</p> <p>An explicit calculation for $\sin BCA$ e.g.</p> $\sin BCA = 7 \times \frac{\sin 61}{9}$ <p>$BCA = 42.86... \text{ si}$</p> <p>$(\widehat{BCD} = 180 - 42.86... =)$</p> <p>Answer in range 137.1° to 137.2° inclusive</p>	<p>M2</p> <p>A1</p> <p>B1</p>	<p>M1 for any correct implicit form e.g.</p> $\frac{\sin BCA}{7} = \frac{\sin 61}{9}$ <p>Accept 43</p> <p>FT 'their 42.8 to 43' providing at least M1 previously awarded.</p> <p>Accept 137 following complete working; degree symbol may be omitted</p>
(4)		
<p>20.(a)</p> $\frac{55}{360} \times \pi \times 12^2 \text{ oe}$ $\frac{1}{2} \times 12^2 \times \sin 55 \text{ oe}$ $\frac{55}{360} \times \pi \times 12^2 - \frac{1}{2} \times 12^2 \times \sin 55 \text{ or better}$ <p>10.1(36....)</p>	<p>B1</p> <p>B1</p> <p>M1</p> <p>A1</p>	<p>(= $22\pi - 72\sin 55$);</p> <p>FT their difference of areas providing at least B1 previously awarded</p> <p>CAO</p> <p>Accept answers in the range 10.1 to 10.15; accept 10 following correct working</p>
<p>20.(b)</p> $\sqrt{12^2 + 12^2 - 2(12)(12)\cos 55} \text{ oe OR}$ $\frac{12\sin(55)}{\sin(62.5)} \text{ OR } 2(12\sin(27.5))$ <p>11(.0819...)</p> $\frac{11}{3}\pi \text{ oe}$ <p>22.6(01...)</p>	<p>M2</p> <p>A1</p> <p>B2</p> <p>B1</p>	<p>M1 for sight of $12^2 + 12^2 - 2(12)(12)\cos 55$ oe OR</p> $\frac{[...]}{\sin(55)} = \frac{12}{\sin(62.5)} \text{ oe OR } \sin(27.5) = \frac{\frac{1}{2}[...]}{12} \text{ oe}$ <p>B1 for $\frac{55}{360} \times 2 \times \pi \times 12$ oe</p> <p>FT providing at least M1 B1 previously awarded</p>
(10)		

<p>21.(a)</p> $y = \frac{x+1}{4} \text{ leading to } 4y-1=x$ <p>or $x = \frac{y+1}{4}$ leading to $4x = y+1$</p> $h^{-1}(x) = 4x-1$ $2x^2 = 4x-1 \text{ leading to } 2x^2 - 4x+1=0$	<p>M1</p> <p>A1</p> <p>A1</p>	<p>Changes the subject fully or swaps the variables and requires one step only to change the subject; must be derived not found from the given equation; allow other variables e.g. $h = \dots$</p> <p>Allow $y = 4x-1$</p>
<p>21.(b)</p> $\frac{-(-4) \pm \sqrt{(-4)^2 - 4(2)(1)}}{2(2)} \text{ or better}$ $\frac{4 \pm \sqrt{8}}{4} \text{ oe, si}$ <p>1.71, 0.29</p>	<p>M1</p> <p>A1</p> <p>B1</p>	<p>Allow if this work seen in (a)</p> <p>Substitution into the formula must be seen for M1, otherwise award M0 A0.</p> <p>Allow one slip in substitution but not in the formula</p> <p>If completing the square used award for sight of $2(x-1)^2 \pm \dots$</p> <p>Implied by 1.707 10..., 0.292 89...</p>
(6)		
<p>22.(a)</p> <p>Reasonable tangent drawn at $t = 3.5$</p> <p>Calculates $\frac{\text{vertical diff}}{\text{horizontal diff}}$</p> <p>Correct gradient</p>	<p>S1</p> <p>M1</p> <p>A1</p>	<p>FT 'their tangent' provided S1 awarded</p> <p>FT 'their $\frac{\text{vertical diff}}{\text{horizontal diff}}$'; must be negative</p>
<p>22.(b)</p> <p>Correct calculation for the area using 3 trapezia and 2 triangles oe e.g.</p> $\frac{1}{2} \times (1) \times 15 + \frac{1}{2} \times (1) \times (15 + 35) + \frac{1}{2} \times (1) \times (35 + 32)$ $+ \frac{1}{2} \times (1) \times (32 + 25) + \frac{1}{2} \times (1) \times 25$ <p>107 (metres)</p>	<p>M3</p> <p>A1</p>	<p>Allow 14 to 15 and 24 to 25 for v at $t=1$ and $t=4$</p> <p>M2 for a correct calculation with one error (possibly repeated) in a v value</p> <p>or</p> <p>M1 for a sum of 5 areas using strips of equal width with at most 2 errors</p> <p>FT</p> <p>Accept answer in range 105 to 109 inclusive with working; ignore any units if stated</p>
(7)		