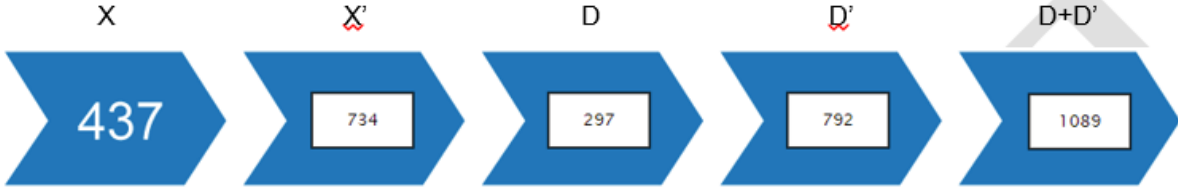


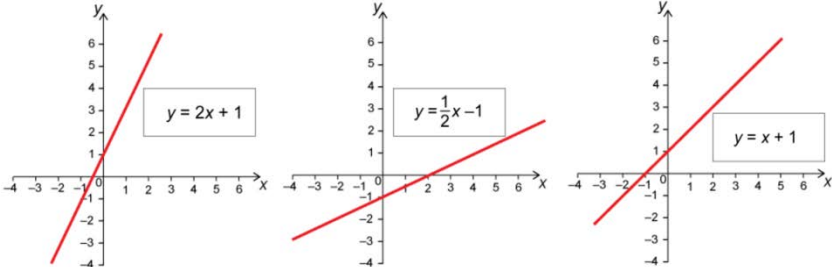
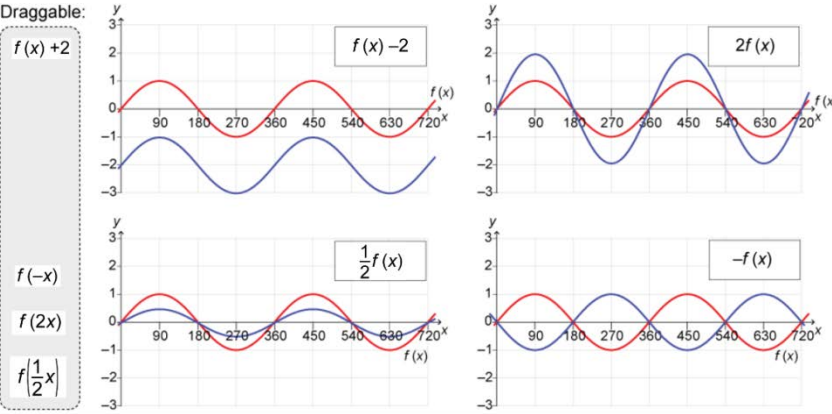
Question	Answers	Notes	Total
<p>1 a</p>	<div style="text-align: center;"> <p>X                      X'                      D                      D'                      D+D'</p>  </div> <ul style="list-style-type: none"> <li>•<sup>1</sup> 734 <b>and</b> their 297 correctly reversed</li> <li>•<sup>2</sup> their D correct</li> <li>•<sup>3</sup> their D and D' correctly added</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> 734 <b>and</b> 792</li> <li>•<sup>2</sup> <math>734 - 437 = 297</math></li> <li>•<sup>3</sup> <math>792 + 297 = 1089</math></li> <li>•<sup>3</sup> 1089 with no entries in their D and their D' : award 1 mark</li> </ul>	<p>3</p>
<p>b</p>	<ul style="list-style-type: none"> <li>•<sup>1</sup> expressing X correctly in terms of multiples of <math>a, b</math> and <math>c</math></li> <li>•<sup>2</sup> expressing X' correctly in terms of multiples of <math>a, b</math> and <math>c</math></li> <li>•<sup>3</sup> subtracting and reversing all signs of their X <b>OR</b> their X'</li> <li>•<sup>4</sup> their answer correct in terms of <math>a</math> and <math>c</math> <i>only</i></li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>100a + 10b + (1)c</math> ACCEPT not seeing this step</li> <li>ACCEPT inappropriate notation provided it reads correctly. Ex: <math>100*a+10*b+1*c</math> DO NOT ACCEPT incorrectly read expressions. Ex: <math>100c+10(b)+a</math></li> <li>•<sup>2</sup> <math>100c + 10b + (1)a</math> ACCEPT not seeing this step</li> <li>•<sup>3</sup> <math>100c+10b+1a - 100a - 10b-1c</math> OE If their X and X' are numbers, ACCEPT their X- their X' only if their result is positive</li> <li>•<sup>4</sup> <math>99c - 99a</math> or <math>99(c - a)</math> or <math>99(a - c)</math> ACCEPT absolute value of <math>99(c - a)</math> OE</li> </ul> <p><b>Notes continued below</b></p>	<p>4</p>

<b>1</b>	<b>b</b>		<p>99c-99a or <math>99(c - a)</math> without working : award 3 marks <math>99c - 99a</math> or <math>99(c - a)</math> with one step of working: award 4 marks</p> <p>•<sup>4</sup> DO NOT ACCEPT unless it is in terms of a and c</p> <p>ACCEPT not seeing absolute value</p> <p><b>SC 1 mark</b> 100a,10b, c and 100c,10b, a</p>	
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Question	Answers	Notes	Total
2	<p>Candidates may use any appropriate algebraic notation to represent the frog and dragonfly here we have used <math>x</math> and <math>y</math></p> <ul style="list-style-type: none"> <li>•<sup>1</sup> setting both equations correctly</li> <li>•<sup>2</sup> one correct step to eliminate one variable <b>OR</b> for substitution</li> <li>•<sup>3</sup> correctly eliminate one variable</li> <li>•<sup>4</sup> Their <math>y</math> correct</li> <li>•<sup>5</sup> Their <math>x</math> correct</li> <li>•<sup>6</sup> their <math>x</math> and their <math>y</math> added correctly</li> </ul> <p><b>Alternative method for trial and error responses</b></p> <ul style="list-style-type: none"> <li>•<sup>1</sup> seeing two numbers with sum 22 <b>OR</b> seeing two numbers with difference 12</li> <li>•<sup>2</sup> seeing values of <math>x</math> and <math>y</math> that satisfy <math>3x + 2y = 22</math></li> <li>•<sup>3</sup> seeing values of <math>x</math> and <math>y</math> that satisfy <math>4y - 2x = 12</math></li> <li>•<sup>4</sup> <math>x</math> or <math>y</math> correct</li> <li>•<sup>5</sup> <math>x</math> and <math>y</math> correct</li> <li>•<sup>6</sup> their values added correctly</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>3x + 2y = 22</math> and <math>4y - 2x = 12</math> OE</li> <li>•<sup>2</sup> for example, <math>6x + 4y = 44</math> and <math>12y - 6x = 36</math> <b>OR</b> <math>y = (22 - 3x)/2</math></li> <li>•<sup>3</sup> 80 seen or 10 seen or 16y or 8x OE</li> <li>•<sup>4</sup> (<math>y =</math>) 5</li> <li>•<sup>5</sup> (<math>x =</math>) 4 ECF substituting their incorrect <math>y</math> in any of their equations</li> <li>•<sup>6</sup> (<math>5 + 4 =</math>) 9</li> </ul> <p>9 without working from •<sup>1</sup> to •<sup>3</sup> : award 4 marks  9 with one of •<sup>1</sup> to •<sup>3</sup> : award 5 marks  9 with two of •<sup>1</sup> to •<sup>3</sup> : award 6 marks</p> <p><b>Alternative method trial and error response</b></p> <ul style="list-style-type: none"> <li>•<sup>1</sup> e.g. <math>12 + 10 = 22</math> <b>OR</b> <math>20 - 8 = 12</math></li> <li>•<sup>2</sup> e.g. <math>3 \times 6 + 2 \times 2 = 22</math></li> <li>•<sup>3</sup> e.g. <math>4 \times 4 - 2 \times 2 = 12</math></li> <li>•<sup>4</sup> 4 or 5</li> <li>•<sup>5</sup> 4 and 5</li> <li>•<sup>6</sup> their 9</li> </ul> <p>9 without working from •<sup>1</sup> to •<sup>3</sup> : award 4 marks  9 with one of •<sup>1</sup> to •<sup>3</sup> : award 5 marks  9 with two of •<sup>1</sup> to •<sup>3</sup> : award 6 marks</p>	6

Question	Answers	Notes	Total								
3	<p><b>a</b></p> <ul style="list-style-type: none"> <li>•<sup>1</sup> two inequalities correct</li> <li>•<sup>2</sup> The third inequality correct</li> <li>•<sup>3</sup> one correct constraint <b>OR</b> three correct constraints not including "equal to"</li> <li>•<sup>4</sup> the second and third constraint correct</li> </ul> <table border="1"> <thead> <tr> <th>Inequalities</th> <th>Constraints</th> </tr> </thead> <tbody> <tr> <td><math>x + y \leq 500</math></td> <td>(Number of) cookies and muffins is less than or equal 500 <i>WTTE cannot exceed, at most</i></td> </tr> <tr> <td><math>y \geq 50</math></td> <td>(number of) muffins more than or equal 50 WTTE exceeds or equal 50, at least 50, a minimum of 50, not less than 50 ACCEPT between 50 and 250 OR bigger than 49 OR can exceed or equal to 50</td> </tr> <tr> <td><math>y \leq x</math></td> <td>(number of) cookies more than or equal (the number) of muffins WTTE exceeds or equal, at least, minimum as, not less than ACCEPT x can exceed or equal y OR y cannot exceed</td> </tr> </tbody> </table>	Inequalities	Constraints	$x + y \leq 500$	(Number of) cookies and muffins is less than or equal 500 <i>WTTE cannot exceed, at most</i>	$y \geq 50$	(number of) muffins more than or equal 50 WTTE exceeds or equal 50, at least 50, a minimum of 50, not less than 50 ACCEPT between 50 and 250 OR bigger than 49 OR can exceed or equal to 50	$y \leq x$	(number of) cookies more than or equal (the number) of muffins WTTE exceeds or equal, at least, minimum as, not less than ACCEPT x can exceed or equal y OR y cannot exceed	<p>ACCEPT if they use x and y instead of cookies and muffins</p> <p>DO NOT ACCEPT cost or price or value of cookie/muffin</p> <ul style="list-style-type: none"> <li>•<sup>3</sup> An example for "<b>OR</b>" Cookies exceeds 100 <b>and</b> muffins exceeds 50 <b>and</b> cookies bigger than muffins</li> <li>•<sup>3</sup> DO NOT ACCEPT ECF from the inequality</li> </ul>	4
Inequalities	Constraints										
$x + y \leq 500$	(Number of) cookies and muffins is less than or equal 500 <i>WTTE cannot exceed, at most</i>										
$y \geq 50$	(number of) muffins more than or equal 50 WTTE exceeds or equal 50, at least 50, a minimum of 50, not less than 50 ACCEPT between 50 and 250 OR bigger than 49 OR can exceed or equal to 50										
$y \leq x$	(number of) cookies more than or equal (the number) of muffins WTTE exceeds or equal, at least, minimum as, not less than ACCEPT x can exceed or equal y OR y cannot exceed										
	<p><b>b</b></p> <p>profit (on/of) one (cookie and/or muffin) OR profit per cookie and per muffin</p>	<p>Profit <b>and</b> one or per must be seen or implied</p> <p>ACCEPT amount of money gained to express profit</p> <p>DO NOT ACCEPT cost or price DO NOT ACCEPT the profit of a muffin is 1.5 times the profit of cookie OE</p>	1								

3	c	<ul style="list-style-type: none"> <li>•<sup>1</sup> evidence of working</li>   <li>•<sup>2</sup> 250 (cookies)</li> <li>•<sup>3</sup> 250 (muffins)</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> ( P =) (1x)450 + 1.50x50  <b>OR</b> ( P =) (1x)250 +1.5x250 <b>OR</b>  525 <b>OR</b> 625  Incorrect substitution and correct  calculation: award only 1 mark</li> <li>•<sup>2</sup> 250 (cookies) ) without  working: award 1 mark</li> <li>•<sup>3</sup> 250 (muffins) without working:  award 1 mark</li>   <li>250 must be seen twice to gain •<sup>2</sup>  and •<sup>3</sup></li>   <li><b>SC 2 marks</b>  525 and 625 seen  <b>or</b>  725 <b>and</b> 50 cookies and 450  muffins</li>   <li><b>SC 1 mark</b>  725 <b>and</b> 50 and 450</li> </ul>	3
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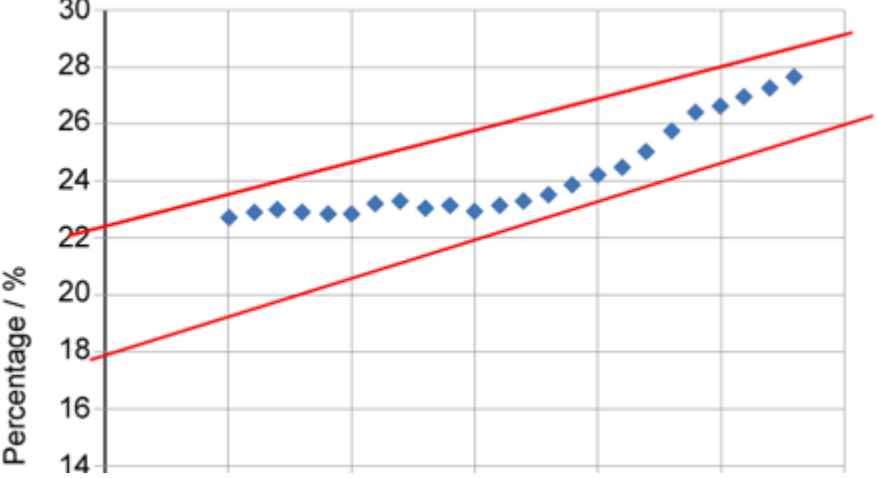
Question	Answers	Notes	Total
4 a	<ul style="list-style-type: none"> <li>•<sup>1</sup> one equation placed correctly</li> <li>•<sup>2</sup> the other two equations placed correctly</li> </ul>		2
b	<ul style="list-style-type: none"> <li>•<sup>1</sup> 1<sup>st</sup> equation placed correctly</li> <li>•<sup>2</sup> 2<sup>nd</sup> equation placed correctly</li> <li>•<sup>3</sup> 3<sup>rd</sup> equation placed correctly</li> <li>•<sup>4</sup> 4<sup>th</sup> equation placed correctly</li> </ul>	<div style="border: 1px dashed gray; padding: 5px; width: fit-content; margin-bottom: 10px;">       Draggable:  <math>f(x) + 2</math>  <math>f(-x)</math>  <math>f(2x)</math>  <math>f\left(\frac{1}{2}x\right)</math> </div>  <p>DO NOT ACCEPT <math>f(-x)</math> Do not award the mark if two functions are dragged on the same graph</p>	4

Question	Answers	Notes	Total
5	<b>a</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> substitutes into magnitude formula</li> <li>•<sup>2</sup> (speed) = 13</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> square root of <math>5^2 + 12^2</math></li> <li>13 without working: award 2 marks</li> </ul>	<b>2</b>
	<b>b</b> <p>adds vector S and C</p> $\begin{pmatrix} 8 \\ 12 \end{pmatrix} \text{ AG}$	$\begin{pmatrix} 5 \\ 12 \end{pmatrix} + \begin{pmatrix} 3 \\ 0 \end{pmatrix} \text{ OR } 5+3 \text{ and } 12+0. \text{ ACCEPT } 5+3 \text{ and } 12$	<b>1</b>
	<b>c</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> evidence of use of dot product</li> <li>•<sup>2</sup> dot product correctly calculated</li> <li>•<sup>3</sup> magnitude of vector R correctly calculated</li> <li>•<sup>4</sup> evidence of substituting into the correct formula</li> <li>•<sup>5</sup> their angle correct</li> </ul> <p><b>Alternative method</b></p> <ul style="list-style-type: none"> <li>•<sup>1</sup> using the tan ratio twice</li> <li>•<sup>2</sup> applying inverse tan for one</li> <li>•<sup>3</sup> applying inverse tan for the second</li> <li>•<sup>4</sup> subtracting their angles</li> <li>•<sup>5</sup> angle correct</li> </ul> <p><i>Another alternative method below</i></p>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>(5 \times 8 + 12 \times 12)</math> may be implied</li> <li>•<sup>2</sup> 184</li> <li>•<sup>3</sup> <math>4\sqrt{13}</math> or <math>2\sqrt{52}</math> or <math>\sqrt{208}</math> or 14.4(22)</li> <li>•<sup>3</sup> ACCEPT <math>\sqrt{8^2 + 12^2}</math> for <math>4\sqrt{13}</math> in calculator display only</li> <li>•<sup>4</sup> <math>(\cos\theta =) 0.9813 \dots</math> or <math>46/(13\sqrt{13})</math> or <math>\frac{\text{their184}}{ \text{their13}   \text{their } 4\sqrt{13} }</math></li> <li>•<sup>5</sup> their <math>11^\circ</math> (.0702 ...) must come from <math>-1 \leq \cos\theta \leq 1</math></li> </ul> <p><b>SC 5 marks</b> <math>\theta = \cos^{-1}\left(\frac{5 \times 8 + (12 \times 12)}{\sqrt{5^2 + 12^2} \times \sqrt{8^2 + 12^2}}\right) = 11^\circ</math></p> <p><b>Alternative method</b></p> <ul style="list-style-type: none"> <li>•<sup>1</sup> using the tan ratio twice</li> <li>•<sup>2</sup> 67.3801 ...</li> <li>•<sup>3</sup> 56.3099 ...</li> <li>•<sup>4</sup> their 67.3801 ... – their 56.3099 ...</li> <li>•<sup>5</sup> <math>11^\circ</math> (.0702 ...)</li> </ul> <p><i>Another alternative method below</i></p>	<b>5</b>

5	c	<p><b>Alternative method</b></p> <ul style="list-style-type: none"> <li>•<sup>1</sup> magnitude of vector R correctly calculated</li> <li>•<sup>2</sup> magnitude of vector C correctly calculated</li> <li>•<sup>3</sup> evidence of substituting their R, C and S into the cosine rule</li> <li>•<sup>4</sup> their <math>\cos\theta</math> correct</li> <li>•<sup>5</sup> their angle correct</li> </ul>	<p><b>Alternative method</b></p> <ul style="list-style-type: none"> <li>•<sup>1</sup> <math>4\sqrt{13}</math> or <math>2\sqrt{52}</math> or <math>\sqrt{208}</math> ACCEPT <math>\sqrt{8^2 + 12^2}</math> for <math>4\sqrt{13}</math> in calculator display only</li> <li>•<sup>2</sup> 3</li> <li>•<sup>3</sup> their <math>3^2 = \text{their } 13^2 + (\text{their } 4\sqrt{13})^2 - 2(\text{their } 13)(\text{their } 4\sqrt{13})\cos\theta</math> may be implied</li> <li>•<sup>4</sup> (<math>\cos\theta =</math>) 0.9813 ... or <math>46/(13\sqrt{13})</math> or <math>\frac{\text{their}(13^2 + (4\sqrt{13})^2 - 9)}{2(\text{their } 13)(\text{their } 4\sqrt{13})}</math></li> <li>•<sup>5</sup> their <math>11^\circ</math> (.0702 ...) must come from <math>-1 \leq \cos\theta \leq 1</math></li> </ul>	5
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Question	Answers	Notes	Total
6 a	<ul style="list-style-type: none"> <li>•<sup>1</sup> (Min) 1 <b>and</b> (Max) 17</li> <li>•<sup>2</sup> correct subtraction to get their 16</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> 1 and 17</li> <li>•<sup>2</sup> 16</li> <li>•<sup>2</sup> DO NOT ACCEPT a negative number</li> </ul> <p>16 without working: award 2 marks</p> <p><b>SC 1 mark</b> Seeing only (6,16) or -16</p>	<b>2</b>
b	<ul style="list-style-type: none"> <li>•<sup>1</sup> identifying any two times 12 hours apart</li> <li>•<sup>2</sup> 12 (hours)</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> 3 and 15.</li> <li>•<sup>1</sup> ACCEPT seeing two times which are 12 hours apart</li> <li>•<sup>1</sup> ACCEPT seeing two points with x-coordinates 12 hours apart</li> <li>•<sup>1</sup> ACCEPT recognizing that there are two cycles in 24 hours OE</li> <li>•<sup>2</sup> DO NOT ACCEPT any other value but 12</li> </ul> <p>12 without working: award 2 marks</p>	<b>2</b>
c	<ul style="list-style-type: none"> <li>•<sup>1</sup> correct substitution</li> <li>•<sup>2</sup> one correct algebraic step</li> <li>•<sup>3</sup> two correct algebraic steps</li> <li>•<sup>4</sup> correct use of their inverse sin</li> <li>•<sup>5</sup> correct step using <math>\pi</math> or 180</li> <li>•<sup>6</sup> their times both correct</li> </ul>	<p>ACCEPT work in degrees instead of radians</p> <ul style="list-style-type: none"> <li>•<sup>1</sup> <math>13 = 8 \sin(\pi t/6) + 9</math></li> <li>•<sup>2</sup> <math>4 = 8 \sin(\pi t/6)</math></li> <li>•<sup>3</sup> <math>\frac{1}{2} = \sin(\pi t/6)</math> ACCEPT seeing •<sup>2</sup> or •<sup>3</sup> for both marks •<sup>2</sup> and •<sup>3</sup></li> <li>•<sup>4</sup> <math>\pi t/6 = \pi/6</math>. ACCEPT using <math>\pi = 180</math> in their calculations and writing <math>30t = 30</math> or <math>\pi t/6 = 30</math> OE ACCEPT <math>t = 1</math> or <math>t = 57(.29..)</math></li> <li>•<sup>5</sup> <math>\pi t/6 = \pi</math> - their <math>\pi/6</math> ACCEPT using <math>\pi = 180</math> in their calculations and writing <math>30t = 180</math> - their 30 <b>or</b> <math>\pi t/6 = 180</math> - their 30</li> <li>•<sup>6</sup> their <math>t = 1</math> (am) <b>and</b> their <math>t = 5</math> (am) Attempts to work with e.g. <math>\pi t/6 = 30</math> cannot be awarded •<sup>6</sup></li> </ul> <p>(<math>t =</math>) 1 (or (<math>t =</math>) 5 without working: award 1 mark</p> <p>(<math>t =</math>) 1 and (<math>t =</math>) 5 without working: award 2 marks  (<math>t =</math>) 1 and (<math>t =</math>) 5 with only •<sup>1</sup> seen: award 3 marks  (<math>t =</math>) 1 and (<math>t =</math>) 5 with only •<sup>2</sup> or •<sup>3</sup> seen: award 4 marks</p>	<b>6</b>

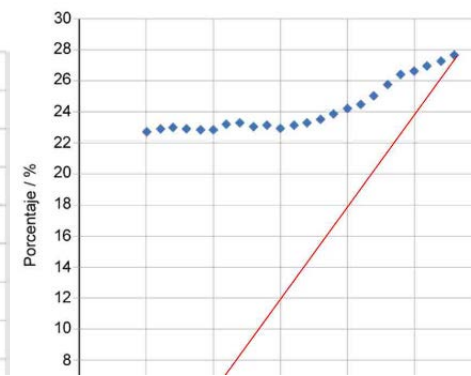
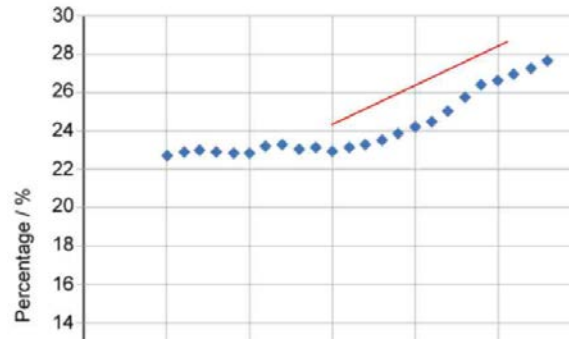
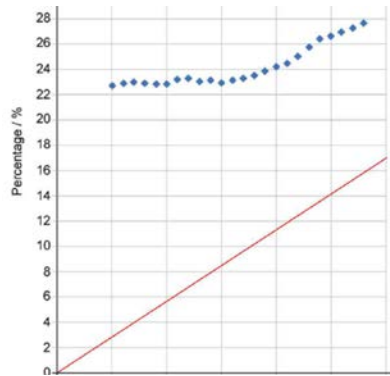
Question		Answers	Notes	Total
7	a	• <sup>1</sup> $\frac{17+1}{100}$	OE	1
	b	<ul style="list-style-type: none"> <li>•<sup>1</sup> dividing 1207000 by 23858000</li> <li>•<sup>2</sup> 0.05059... or 0.0506 or 5.059... (%) or 5.06(%)</li> <li>5 (%) AG</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> ACCEPT 1207/23858</li> <li>•<sup>2</sup> ACCEPT 0.0505 or 5.05(%)</li> </ul> <p>ACCEPT seeing cross multiplication process for 2 marks Examples: 23858 – 100% 1207 – 5.059%</p> <p><b>SC 1 mark</b> 0.05 x 23 858 000 = 1 192 900 or <math>\cong</math> 1207000</p> <p><b>OR</b> 1 207 000 / 0.05 = 24 140 000 or <math>\cong</math> 23858000</p>	2
	c	<ul style="list-style-type: none"> <li>•<sup>1</sup> 0.82 written on both branches</li> <li>•<sup>2</sup> 0.05 and 0.95</li> </ul>		2
	d	<ul style="list-style-type: none"> <li>•<sup>1</sup> calculating probability from one branch</li> <li>•<sup>2</sup> calculating probability from the other branch</li> <li>•<sup>3</sup> adding correctly their probabilities of their branches</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> 0.05 x 0.18</li> <li>•<sup>2</sup> 0.95 x 0.18</li> <li>•<sup>3</sup> 0.05 x 0.18 + 0.95 x 0.18 = 0.18</li> </ul> <p>0.18 without working: award 1 mark</p> <p>ACCEPT 5% , 5/100 for 0.05 OE</p>	3

7	e	<ul style="list-style-type: none"> <li>•<sup>1</sup> dividing their probability of first branch by their result in (d)</li> <li>•<sup>2</sup> their result correctly after division</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>\frac{0.05 \times 0.18}{0.18}</math></li> <li>•<sup>2</sup> 0.05</li> </ul> <p>0.05 without working: award 2 marks</p>	<b>2</b>
	f	<ul style="list-style-type: none"> <li>•<sup>1</sup> independent (events)</li> </ul>	<p>ACCEPT incorrect spellings of "independent" OE</p> <p>ACCEPT independent even if answers for b) and e) are not correct</p>	<b>1</b>
	g	<ul style="list-style-type: none"> <li>•<sup>1</sup> the line is crossing twice or touching at least two points</li> <li>•<sup>2</sup> domain covering at least year 1994 to 2010 and the line is within the range shown below</li> </ul> 	<ul style="list-style-type: none"> <li>•<sup>1</sup> see examples below</li> <li>•<sup>2</sup> see examples below</li> </ul>	<b>2</b>

7

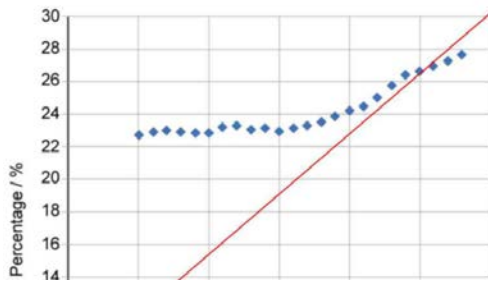
g

Examples not acceptable (0 marks): Not crossing twice, Not touching two points and not in range

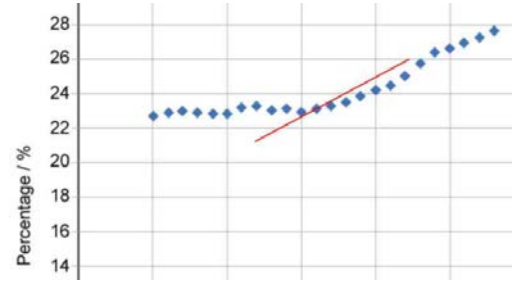


Examples acceptable for •<sup>1</sup> or •<sup>2</sup> only (1 mark)

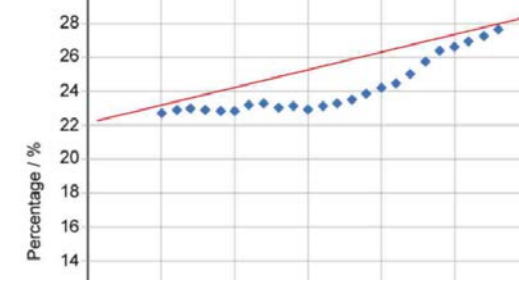
•<sup>1</sup> only (Touching two points)



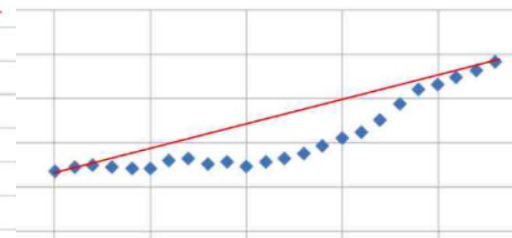
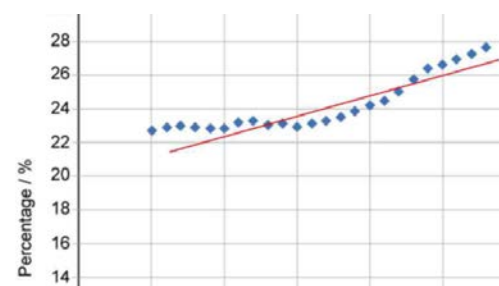
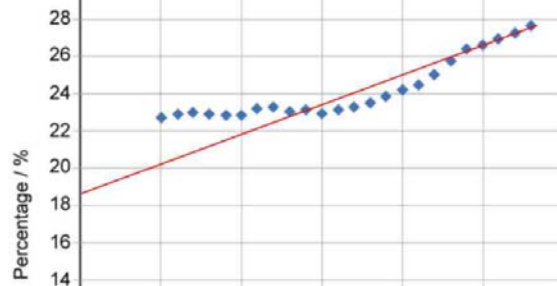
•<sup>1</sup> only (Touching two points)



•<sup>2</sup> only (In range but not touching two points)



Examples acceptable for •<sup>1</sup> and •<sup>2</sup> (2 marks)



7	h	<b>Mark</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
		<b>F: Identification of Factors</b>	<p>One factor mentioned from:</p> <ul style="list-style-type: none"> <li>- Nature of the increase</li> <li>- Life expectancy</li> <li>- Birth rate or mortality</li> <li>- Rules of immigration</li> <li>- Gradient or rate of line or Percentage increase of immigrants seen</li> <li>- Percentage of immigrants</li> <li>- Change in population distribution (human landscape)</li> <li>- Economy status</li> <li>- Imagined factor like disaster happening in Australia</li> </ul> <p>DO NOT ACCEPT only saying many factors</p>	<p>Two factors mentioned from:</p> <ul style="list-style-type: none"> <li>- Nature of the increase</li> <li>- Life expectancy</li> <li>- Birth rate or mortality</li> <li>- Rules of immigration</li> <li>- Gradient or rate of line or Percentage increase of immigrants seen</li> <li>- Percentage of immigrants</li> <li>- Change in population distribution (human landscape)</li> <li>- Economy status</li> <li>- Imagined factor like disaster happening in Australia</li> </ul> <p>DO NOT ACCEPT only saying many factors</p>		
		<b>E: Estimation</b>	<p>Estimation of year in range (2055 to 2300) or (in 42 to 287 years) without showing calculations</p> <p><b>OR</b></p> <p>Estimation not in range using their incorrect line equation or incorrect proportions or percentages</p>	<p>Estimation of year in range (2055 to 2300) using:</p> <p>equation of line not matching their line of best fit</p> <p><b>OR</b></p> <p>Incorrect proportion or percentage increase of immigration Ex: Estimate 2080 using 6% in 23 years, or estimate 2150 using 0.3% every year, or 2070 using 1% every 5 years</p>	<p>Estimation of year in range (2055 to 2300) using:</p> <p>equation of line matching their line of best fit but incorrect result Ex: reaching estimation 2100 from <math>y=0.2x+20</math></p> <p><b>OR</b></p> <p>Using appropriate proportions Ex: Estimate 2180 using 6% in 23 years, or estimate 2090 using 0.3% every year, or 2070 using 2% every 5 years</p>	<p>Estimation of year in range (2055 to 2300) using:</p> <p>correctly equation of line matching their line of best fit Ex: reaching estimation 2120 from <math>y=0.2x+23</math></p>

7	h	Mark	1	2	3	4
		<b>D: Degree of Accuracy</b>	<p>Suitable rounding used for their estimated year</p> <p>DO NOT ACCEPT if they just write down a year without any reference or calculations</p> <p><b>SC:</b> if they use their line equation or proportions correctly and their estimated year does not need rounding: award D1</p>			
		<b>J: Justification of whether it makes sense</b>	<p>Inaccurate with weak reason Examples: 1. Inaccurate because I used line of best fit. 2. Inaccurate because I used % which are not accurate inaccurate because the difference between what I estimated and news headline is very big</p> <p><b>OR</b> Accurate with valid reason Examples: 1. Accurate because I used my line of best fit to estimate 2. Accurate because I used average % of increase 3. Accurate because I considered all data given DO NOT ACCEPT My prediction is accurate because I made the calculations DO NOT ACCEPT accurate or inaccurate without reason</p> <p>Can be awarded only if E1 is achieved</p>	<p>Inaccurate with a valid reason related to variables affecting the future Examples: 1. The prediction I made not very accurate because many factors may vary 2. Predictions using line of best fit for the future not guaranteed 3. The prediction using the line equation not very accurate because it is taking only a window or isolated time 4. The prediction using the line equation not very accurate because it assumes the future follows same pattern 5. My predictions not very accurate because the population (human landscape) can change in Australia</p> <p>ACCEPT Calculating using their line equation the % immigration in 2050 and showing it is not 50%</p>		

7	h	<b>Mark</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
		<b>N: Comment on News headline</b>	<p>Comment on the news headline, with a supporting reason, seen anywhere</p> <p>Example:</p> <ol style="list-style-type: none"> <li>1. Not accurate because I estimated my calculation 2300</li> <li>2. It can be correct as my value estimated is close</li> <li>3. Many factors affect it they cant say for sure</li> </ol> <p>DO NOT ACCEPT right or wrong headline without reason</p>			
<b>10 marks</b>						

Question	Answers	Notes	Total																																
8	<p><b>a</b></p> <ul style="list-style-type: none"> <li>•<sup>1</sup> two correct area values</li> <li>•<sup>2</sup> third correct value and correct subtraction to get 3200 AG</li> </ul> <p><b>OR</b> finding the area of shaded</p> <ul style="list-style-type: none"> <li>•<sup>1</sup> correct area for one shaded rectangle</li> <li>•<sup>2</sup> second correct area for shaded rectangle and addition seen</li> </ul>	<p>Values 10000, 6400, 400 e.g. 10 000 – 6 400 - 400</p> <p><b>OR</b></p> <ul style="list-style-type: none"> <li>•<sup>1</sup> For example: 1600 OR 2000</li> <li>•<sup>2</sup> 2 x 1600 OR 2000 + 1200</li> </ul>	2																																
	<p><b>b</b></p> <p>60 and 4800 twice</p>	<table border="1"> <thead> <tr> <th>Length of AC in cm</th> <th>Length of AB (L) in cm</th> <th>Length of BC in cm</th> <th>Shaded area (A) in cm<sup>2</sup></th> </tr> </thead> <tbody> <tr><td>100</td><td>20</td><td>80</td><td>3200</td></tr> <tr><td>100</td><td>30</td><td>70</td><td>4200</td></tr> <tr><td>100</td><td>40</td><td></td><td></td></tr> <tr><td>100</td><td>50</td><td>50</td><td>5000</td></tr> <tr><td>100</td><td></td><td>40</td><td></td></tr> <tr><td>100</td><td>70</td><td>30</td><td>4200</td></tr> <tr><td>100</td><td>80</td><td>20</td><td>3200</td></tr> </tbody> </table>	Length of AC in cm	Length of AB (L) in cm	Length of BC in cm	Shaded area (A) in cm <sup>2</sup>	100	20	80	3200	100	30	70	4200	100	40			100	50	50	5000	100		40		100	70	30	4200	100	80	20	3200	1
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	<p><b>c</b></p> <p>a suitable pattern described in appropriate terminology</p>	<p>Some examples:  it's quadratic  It increases and then decreases  Maximum at 50  Maximum 5000  Symmetry or symmetry about 5000 or 50  AB x BC x 2 or WTTE i.e Second column x third column x 2  ACCEPT: They are all multiples of 100</p>	1																																
	<p><b>d</b></p> <ul style="list-style-type: none"> <li>•<sup>1</sup> attempt to express the general rule in terms of their L</li> <li>•<sup>2</sup> correct general rule for A in terms of L</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> (A =) 200L – 2LL OR 200*L – 2L*L OR 200n - n<sup>2</sup></li> <li>•<sup>2</sup> (A =) 200L – 2L<sup>2</sup> OR 2L(100 – L). ACCEPT (A =)200 x L – 2 x L<sup>2</sup> or 2L x (100 – L)</li> </ul> <p><b>SC 1 mark</b>  seeing (100 – L)  <b>or</b>  seeing 2L<sup>2</sup> or 2L  <b>or</b>  seeing AB x(100 - AB) x 2</p>	2																																

8	e	<ul style="list-style-type: none"> <li>•<sup>1</sup> substitute L different than (20, 30, 40, 50, 60, 70, 80) into their rule</li> <li>•<sup>2</sup> correctly calculate their value of A after substitution of L different than (20, 30, 40, 50, 60, 70, 80)</li> <li>•<sup>3</sup> recognizing that their result is the same as their predicted value</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> Example: use <math>L = 10</math> or <math>90</math> <math>200(10) - 2(10)^2</math> or their own value of L</li> <li>•<sup>2</sup> Example: 1800 (for the <math>L = 10</math>)</li> <li>•<sup>3</sup> Same as value I predicted in table (and we find the candidate has 1800 in the table for <math>L = 10</math>) OR same as when we continue the pattern and explains how 1800 is obtained from pattern of constant second difference OR the same value given by the simulator</li> <li>•<sup>3</sup> ACCEPT seeing the 1800 in the table and seeing their calculated <math>A = 1800</math> when <math>L = 10</math></li> </ul> <p><b>SC 1 mark</b> if “tested” correctly with a value from the table. for example: tests with <math>L = 50</math> to get <math>P = 5000</math> and recognizing their result is same as table</p>	3
	f	<ul style="list-style-type: none"> <li>•<sup>1</sup> correctly substituting in area formula</li> <li>•<sup>2</sup> evidence of subtracting their two areas from the whole</li> <li>•<sup>3</sup> dividing by 2</li> </ul> <p><math>600\pi</math> AG</p>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>\pi 30^2</math> or <math>\pi 20^2</math></li> <li>•<sup>2</sup> <math>2500\pi - 900\pi - 400\pi</math></li> <li>•<sup>3</sup> <math>(A = )1250\pi - 450\pi - 200\pi</math></li> </ul> <p>ACCEPT •<sup>2</sup> and •<sup>3</sup> in any order</p> <ul style="list-style-type: none"> <li>•<sup>3</sup> ACCEPT dividing by 2 seen in formula step for •<sup>3</sup></li> <li>•<sup>3</sup> ACCEPT approximated answers leading to <math>1884 = 600\pi</math></li> </ul> <p>Seeing only <math>1250\pi - 450\pi - 200\pi</math> : award 3 marks Seeing only <math>1250\pi + 650\pi</math> : award 2 marks</p> <p><math>600\pi</math> without working : award 0 marks</p>	3

8	g	Mark	1	2	3	4
		<b>Predictions (P)</b>	Predict correctly one value of A Examples: $r = 25, A = 625\pi$  <b>OR</b>  Predict correctly three values of A without corresponding r	Predict correctly three values of A Examples: $r = 25, A = 625\pi$ $r = 30, A = 600\pi$ $r = 35, A = 525\pi$ <b>DO NOT ACCEPT</b> if corresponding r not mentioned		
		<b>Description (D)</b>	Attempt to describe a pattern in words. Examples 1. Increasing then decreasing 2. It is quadratic or parabola EX. Symmetrical	Describe correctly pattern in words Example: A are multiples of 5  <b>OR</b>  Attempts to describe radius or diameter of the semicircles as a general rule Ex: $100 - 2r$ or $50 - r$ could be seen in the response, table or diagram	Attempt to describe pattern for A as general rule. Examples: 1. $(A =) 50^2 - r^2 - (50 - r)^2$ 2. $(A =) 50^2 - AC^2 - (50 - AC)^2$  <b>OR</b>  Evidence of subtracting two small semicircles/circles from a larger one.	Correctly describe pattern as general rule for A Examples: 1. $A = \pi r (50 - r)$ 2. $A = \pi (50r - r^2)$ 3. $A = \frac{2500\pi}{2} - \frac{\pi r^2}{2} - \frac{\pi(50-r)^2}{2}$  <b>OR the below but award N1</b> $(A =) \pi r (50 - r)$ $(A =) \pi (50r - r^2)$ the general rule is $\pi r (50 - r)$
		<b>Testing (T)</b>	Attempt to use r from {5,10,15, 20} in their described pattern or general rule	Recognizing that their result is the same as value in table  ACCEPT seeing their calculated A value from their general rule and the value in the table being equal even without $\pi$		
		<b>Verifying (V)</b>	Attempt to use r other than 5,10,15, 20 in their described pattern or general rule	Calculate correctly their value of A using their r other than 5,10,15, 20 in their general rule	Recognizing that their result is the same as their predicted value ACCEPT seeing their calculated A value from their general rule and their predicted value in the table being equal provided their calculated value includes $\pi$	

8	g					
		<b>Mark</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
		<b>Justify/proof (J)</b>	Attempt to justify their described pattern or rule or general rule Examples 1. Trying at least two values and justifying that they are the same or rule works 2. We always multiply $r$ by the difference between 50 and $r$ 3. The second difference is constant	Good attempt to Justify their general rule Examples: 1. The second difference is constantly 50 2. The equation is quadratic with – ve coefficient of $r^2$ so increasing then decreasing	Attempt to prove the general rule for the area A Example: Attempt to add areas in terms of $r$	Correctly prove the general rule for the Area A Example: Adding the areas in terms of $r$ correctly  J4 automatically gains T2 and V3
		<b>Notation and terminology (N)</b>	Notation <b>or</b> terminology is correct <b>OR</b> the notation and terminology have significant errors for example 3.14 for pi <b>OR</b> The general rule is correct but not in correct notation $A = 50^2 - r^2 - (50 - r)^2/2$ Ex: The general rule is $\pi(50r - r^2)$	The notation <b>and</b> terminology are correct  <b>Note:</b> One minor error, not in general rule, can be overlooked  Can be awarded only if they have a general rule  ACCEPT the use of x or * for multiplication		
<b>Communication (L)</b>	Very weak communication  Two or three lines of communication <b>OR</b> Only calculations or algebraic steps	Weak communication  More than three lines of communication but lack coherence	Good communication  More than three lines of coherent communication  Can be awarded only if J2 is achieved			
<b>20 marks</b>						