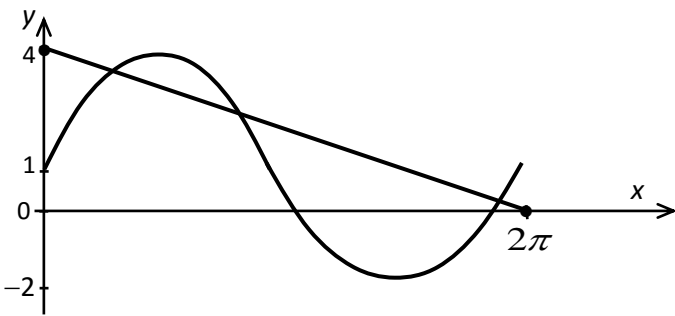


No.	Mark Scheme		Total Marks
1	$s = 14 - 4r$ P1 $r^2 - 4(14 - 4r) + (14 - 4r)^2 = 28$ K1 $17r^2 - 96y + 112 = 0$ $(r - 4)(17r - 28) = 0$ K1 $\frac{-(-96) \pm \sqrt{(-96)^2 - 4(17)(112)}}{2(17)}$ $r = 4, \frac{28}{17} (1.6471)$ N1 $s = -2, \frac{126}{17} (7.4118)$ N1	<div style="border: 1px dashed black; padding: 5px;">           or <math>r = \frac{14 - s}{4}</math> P1  <math>s^2 - 4s + s^2 = 28</math> K1  <math>17s^2 - 92s - 252 = 0</math>  <math>(s + 2)(17s - 126) = 0</math> K1  <math display="block">\frac{-(-92) \pm \sqrt{(-92)^2 - 4(17)(-252)}}{2(17)}</math> <math>s = -2, \frac{126}{17} (7.4118)</math> N1  <math>r = 4, \frac{28}{17} (1.6471)</math> N1         </div>	5
2	<p>(a) <math>x = \frac{(2)(-1) + (1)(5)}{3}</math> @ <math>y = \frac{(2)(4) + (1)(7)}{3}</math> K1  <math>L = (1, 5)</math> N1</p> <p>(b) <math>m_{KM} = \frac{1}{2}</math>, then <math>m_{LN} = -2</math> K1  <math>y = -2x + 7</math> &amp; <math>y = 3x - 8</math> K1            (solve simultaneous equations)  <math>N(3, 1)</math> N1</p> <p>(c) <math>\frac{1}{2} \begin{vmatrix} -1 &amp; 3 &amp; 5 &amp; -1 \\ 4 &amp; 1 &amp; 7 &amp; 4 \end{vmatrix} = \frac{1}{2}(-1 + 21 + 20 + 7 - 5 - 12)</math> K1  <math>= 15</math> N1</p>		7

No.	Mark Scheme	Total Marks
3	<p>(a) Listing 100, 80, 64, 51.2, 40.96, 32.768 32.768 <math>n = 6</math></p> <p><b>ATAU</b></p> <p><math>(100)(0.8)^{n-1} &lt; 40</math> <math>(n-1)\log_{10}(0.8) &lt; \log_{10}(0.4)</math> <math>n = 6</math></p> <p>(b) <math>S = \frac{100}{1 - 0.8}</math> <math>= 500</math></p> <p>(c) <math>(60)(0.8)^{8-1}</math> <math>12.58^\circ</math></p>	7
4	<p>(a) </p> <p>shape (sine) P1 Amplitude and 1 cycle (<math>0 &lt; x \leq 2\pi</math>) P1 shifted P1</p> <p>(b) <math>y = 4 - \frac{2}{\pi}x</math> N1 Sketch the straight line (gradient or y-intercept) K1 No of solutions = 3 N1</p>	6

No.	Mark Scheme	Total Marks
5	<p>(a) <math>k = 192</math> P1</p> <p>(b) (i) <math>m = \sqrt{\frac{1125}{5}} = 15</math> P1</p> <p>(ii) <math>15 = \sqrt{\left(\frac{\sum x^2}{5} - \left(\frac{150}{5}\right)^2\right)}</math> K1</p> <p><math>\sum x^2 = 5625</math> N1</p> <p>(c) Group P, <math>\sum x^2 = 14400</math> P1</p> <p><math>\bar{x} = \frac{192+150}{9}</math> or <math>\sigma^2 = \frac{14400+5625}{9} - (38)^2</math> K1</p> <p><math>= 38</math> N1</p> <p><math>= 781</math> N1</p>	8
6	<p>(a) <math>\frac{dh}{dt} = \frac{5}{t}</math> P1 , <math>\frac{dV}{dt} = \frac{-90}{t}\pi</math> P1</p> <p><math>\frac{dV}{dt} = \frac{dV}{dh} \times \frac{dh}{dt}</math></p> <p><math>\frac{-90}{t}\pi = \frac{dV}{dh} \times \frac{5}{t}</math> or equivalent K1</p> <p><math>\frac{dV}{dh} = -18\pi</math> N1</p> <p>(b) <math>\delta V = 16.56\pi - 18\pi = -1.44\pi</math> K1</p> <p><math>\delta h \approx \frac{dh}{dV} \times \delta V \approx \frac{-1}{18\pi} \times -1.44\pi</math> K1</p> <p><math>= 0.08</math> N1</p>	7

No.	Mark Scheme	Total Marks
7	Refer to the graph	10
8	<p>(a) <math>\vec{CD} = \vec{CO} + \vec{OD}</math> K1  <math>= -3\vec{a} + \frac{1}{3}\vec{b}</math> N1</p> <p><math>\vec{AB} = \vec{AO} + \vec{OB}</math> K1  <math>= -\vec{a} + \vec{b}</math> N1</p> <p>(b) (i) <math>\vec{OP} = \vec{OC} + \vec{CP} = 3\vec{a} + m(-3\vec{a} + \frac{1}{3}\vec{b})</math> K1  <math>= (3-3m)\vec{a} + \frac{1}{3}m\vec{b}</math> N1</p> <p>(ii) <math>\vec{OP} = \vec{OA} + \vec{AP} = \vec{a} + n(-\vec{a} + \vec{b})</math>  <math>= (1-n)\vec{a} + n\vec{b}</math> N1</p> <p>(iii) <math>3-3m = 1-n</math> &amp; <math>\frac{1}{3}m = n</math> K1</p> <p style="text-align: right;">solve simultaneous equations</p> <p><math>n = \frac{1}{4}</math> &amp; <math>m = \frac{3}{4}</math> N1 N1</p>	10
9	<p>(a) (i) <math>P(X \geq 2)</math>  <math>P(X = 2) + P(X = 3) + P(X = 4) + \dots + P(X = 8)</math> K1  or <math>1 - [P(X = 0) + P(X = 1)]</math>  <math>1 - [{}^8C_0(0.25)^0(0.75)^8 + {}^8C_1(0.25)^1(0.75)^7]</math> K1  0.6329 N1</p> <p>(ii) <math>npq = 186</math> K1  <math>n = 992</math> N1</p> <p>(b) <math>P(X &gt; 56.2) = 0.0901</math> K1  or <math>P(X &lt; 43.4) = 0.0314</math></p> <p><math>\frac{56.2 - \mu}{\sigma} = 1.34</math> or <math>\frac{43.4 - \mu}{\sigma} = -1.86</math> K1</p> <p>solve simultaneous equations K1</p> <p><math>\sigma = 4</math> N1</p> <p><math>\mu = 50.84</math> N1</p>	10

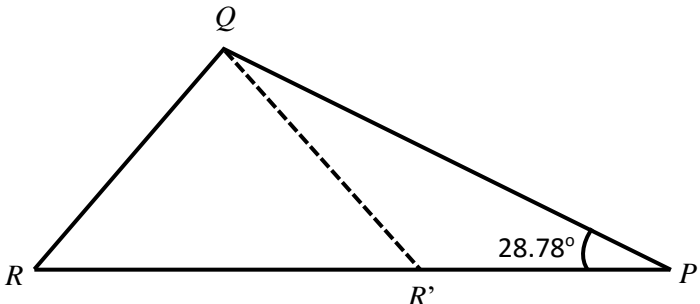
No.	Mark Scheme	Total Marks
10	<p>(a) <math>(-1, 0)</math> <span style="float: right;"><b>N1</b></span></p> <p>(b) <math>\left  \int_0^1 (y^2 - 1) dy \right </math> OR <math>\int_1^3 (y^2 - 1) dy</math> OR <math>\frac{1}{2}(3)(8)</math> <span style="float: right;"><b>K1</b></span></p> <p><math>= \left[ \frac{y^3}{3} - y \right]_0^1 + \left[ \frac{y^3}{3} - y \right]_1^3 + 12</math> <span style="float: right;"><b>K1 (integrate)</b></span></p> <p style="text-align: center;"><b>K1 (adde)    K1 (use limit)</b></p> <p><math>= \left( -\frac{2}{3} \right) + \frac{20}{3} + 12</math> <span style="float: right;"><b>K1 (for <math>\frac{2}{3}</math>)</b></span></p> <p><math>= \frac{58}{3}</math> <span style="float: right;"><b>N1</b></span></p> <p><b>OR</b></p> <p><math>\left  \int_0^1 (y^2 - 1) dy \right </math> OR <math>\frac{1}{2}(6+3)(8)</math> OR <math>\int_0^8 (x+1)^{\frac{1}{2}} dx</math> <span style="float: right;"><b>K1</b></span></p> <p><math>= \left[ \frac{y^3}{3} - y \right]_0^1 + 36 - \left[ \frac{(x+1)^{\frac{3}{2}}}{\frac{3}{2}} \right]_0^8</math> <span style="float: right;"><b>K1 (integrate)</b></span></p> <p style="text-align: center;"><b>K1 ( added &amp; subtract)    K1 (use limit)</b></p> <p><math>= \left( -\frac{2}{3} \right) + 36 - \frac{52}{3}</math> <span style="float: right;"><b>K1 (for <math>\frac{2}{3}</math>)</b></span></p> <p><math>= \frac{58}{3}</math> <span style="float: right;"><b>N1</b></span></p> <p>(c) <math>\pi \int_0^8 y^2 dx = \pi \int_0^8 (x+1) dx</math></p> <p><math>= \pi \left[ \frac{x^2}{2} + x \right]_0^8</math> <span style="float: right;"><b>K1 (integrate)</b></span></p> <p><math>= \pi [(32 - 8) - (0)]</math> <span style="float: right;"><b>K1 (use limit)</b></span></p> <p><math>= 40\pi</math> <span style="float: right;"><b>N1</b></span></p>	<b>10</b>

No.	Mark Scheme	Total Marks
<b>11</b>	<p>(a) <math>\sin \angle BAC = \frac{5}{6}</math> K1  <math>\angle BAC = 0.9851 \text{ rad}</math> (accept 0.9852 rad) N1</p> <p>(b) <math>RC = 3.683</math> or arc of <math>PR = \frac{\pi}{2}(5)</math> K1  Arc of <math>BC = 12(0.9851)</math> K1  <math>= 11.821</math>  <math>= 6 + 3.683 + 7.855 + 11.821</math> K1  <math>= 29.35</math> (accept 29.36) N1</p> <p>(c) Area of sector <math>ABC = \frac{1}{2}(12)^2(0.9851)</math> K1  <math>\frac{1}{2}(5)^2\left(\frac{\pi}{2}\right)</math> or <math>\frac{1}{2}(5)(3.317)</math> K1  <math>= \frac{1}{2}(12)^2(0.9851) - \frac{1}{2}(5)^2\left(\frac{\pi}{2}\right) - \frac{1}{2}(5)(3.317)</math> K1  <math>= 42.99 \text{ cm}^2</math> (accept 43) N1</p>	<b>10</b>

No.	Mark Scheme	Total Marks
12	<p>(a) (i) <math>v = \int (4 - 2t) dt</math></p> <p><math>v = 4t - t^2</math> K1</p> <p><math>4 - 2t = 0</math> K1</p> <p><math>t = 2</math></p> <p><math>4(2) - (2)^2</math></p> <p><math>4 \text{ ms}^{-1}</math> N1</p> <p>(ii) <math>4t - t^2 = 0</math> (accept <math>4t - t^2 &lt; 0</math>) K1</p> <p><math>t = 4</math> N1</p> <p>(b) (i)</p> <p>N1 graph shape N1 (0,0) (2,4) (4,0) (5,-5)</p> <p>(ii) <math>s = \int v dt</math> Integrate v to find s K1</p> <p><math>= \left[ 2t^2 - \frac{t^3}{3} \right]_0^4 + \left[ 2t^2 - \frac{t^3}{3} \right]_4^5</math> K1</p> <p><math>= \frac{32}{3} + \frac{7}{3}</math></p> <p><math>= 13</math> N1</p>	

No.	Mark Scheme	Total Marks
<b>13</b>	<p>(a) (i) <math>\frac{Q}{75} \times 100 = 105</math> K1</p> <p><math>Q = \text{RM } 78.75</math> N1</p> <p>(ii) <math>\frac{183}{R} \times 100 = 122</math> K1</p> <p><math>R = \text{RM } 150</math> N1</p> <p>(b) (i) <math>\frac{110(3) + 105m + 120m + 102(2m)}{3 + 4m} = 108</math> P1( for <math>\Sigma IW</math>)</p> <p>K1</p> <p><math>m = 2</math> N1</p> <p>(ii) <math>\frac{112(3) + 107(2) + 122(2) + 107(4)}{11} = 111.09</math> K1</p> <p><math>\frac{111.09}{108} \times 100</math> K1</p> <p><math>= 102.86</math> N1</p>	<b>10</b>



No.	Mark Scheme	Total Marks
<b>14</b>	Refer to the graph	
<b>15</b>	<p>(a) (i) <math>\frac{1}{2}(PQ)(15)\sin 28.78^\circ = 48.71</math> K1</p> <p><math>PQ = 13.49</math> N1</p> <p>(ii) <math>QR^2 = 15^2 + 13.49^2 - 2(15)(13.49)\cos 28.78^\circ</math> K1</p> <p><math>QR = 7.23</math> N1</p> <p>(iii) <math>\frac{\sin \angle QRP}{13.49} = \frac{\sin 28.78^\circ}{7.23}</math> K1</p> <p><math>\angle QRP = 63.94^\circ</math> N1</p> <p>(b) (i)</p> <div style="text-align: center;">  </div> <p style="text-align: right;">N1</p> <p>(ii) <math>48.71 - \frac{1}{2}(7.23)(7.23)\sin 52.12^\circ</math> P1 for 51.12°</p> <p style="text-align: right;">K1 (subtract)</p> <p><math>28.08 \text{ cm}^2</math> N1</p>	