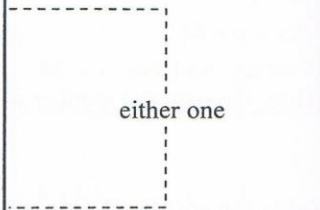


Solution	Marks	Remarks
<p>1. <math>\frac{(xy)^2}{x^{-5}y^6}</math></p> $= \frac{x^2y^2}{x^{-5}y^6}$ $= \frac{x^{2-(-5)}}{y^{6-2}}$ $= \frac{x^7}{y^4}$	<p>1M</p> <p>1M</p> <p>1A</p> <p>------(3)</p>	<p>for <math>(ab)^m = a^m b^m</math></p> <p>for <math>\frac{a^m}{a^n} = a^{m-n}</math></p>
<p>2. <math>a(b+7) = a+b</math></p> $ab+7a = a+b$ $7a-a = b-ab$ $6a = b(1-a)$ $b = \frac{6a}{1-a}$	<p>1M</p> <p>1M</p> <p>1A</p>	<p>for putting <math>b</math> on one side</p> <p>for factorization</p>
$b+7 = \frac{a+b}{a}$ $b - \frac{b}{a} = 1-7$ $b(1-\frac{1}{a}) = -6$ $b(\frac{a-1}{a}) = -6$ $b = \frac{-6a}{a-1}$	<p>1M</p> <p>1M</p> <p>1A</p> <p>------(3)</p>	<p>for putting <math>b</math> on one side</p> <p>for factorization</p>
<p>3. (a) <math>3m^2 - mn - 2n^2</math></p> $= (3m+2n)(m-n)$ <p>(b) <math>3m^2 - mn - 2n^2 - m + n</math></p> $= (3m+2n)(m-n) - m + n$ $= (3m+2n)(m-n) - (m-n)$ $= (m-n)(3m+2n-1)$	<p>1A</p> <p>1M</p> <p>1A</p> <p>------(3)</p>	<p>for using (a)</p>
<p>4. (a) Let \$ <math>x</math> be the cost of the handbag.</p> $x(1+40\%) = 560$ $x = \frac{560}{1+40\%}$ $x = 400$ <p>Thus, the cost of the handbag is \$ 400 .</p>	<p>1M</p> <p>1A</p>	<p>u-1 for missing unit</p>
<p>(b) The percentage profit</p> $= \left( \frac{460-400}{400} \right) 100\%$ $= 15\%$	<p>1M</p> <p>1A</p> <p>------(4)</p>	<p>accept without 100%</p>

Solution	Marks	Remarks
<p>Let <math>x</math> be the number of games that the champion wins. Then, the number of games drawn will be <math>36 - x</math> . Now, we have <math>3x + (36 - x) = 84</math> . Solving, we have <math>x = 24</math> . Thus, the required number of games is <math>24</math> .</p>	<p>1A 1M + 1A 1A</p>	<p>1M for <math>3x + (a - x)</math></p>
<p>Let <math>x</math> be the number of games that the champion wins and <math>y</math> be the number of games that the champion draws.  <math display="block">\begin{cases} x + y = 36 \\ 3x + y = 84 \end{cases}</math> Solving, we have <math>x = 24</math> . Thus, the required number of games is <math>24</math> .</p>	<p>1A 1M + 1A 1A</p>	<p>1M for <math>3x + y</math></p>
------(4)		
<p>(a) <math>\frac{1}{3} \pi r^2 (12) = 2 \left[ \frac{1}{2} \left( \frac{4}{3} \pi r^3 \right) \right]</math> <math>r = 3</math></p>	<p>1M 1A</p>	<p>for <math>V_1 = 2V_2</math> u-1 for having unit</p>
<p>(b) The required volume  <math display="block">= \frac{1}{2} \left( \frac{4}{3} \pi r^3 \right) + \frac{1}{3} \pi r^2 (12)</math> <math display="block">= \frac{2}{3} \pi (3^3) + 4\pi (3^2)</math> <math display="block">= 54\pi \text{ cm}^3</math></p>	<p>1M 1A</p>	<p>u-1 for missing unit</p>
<p>The required volume  <math display="block">= \frac{3}{2} \left( \frac{4}{3} \pi r^3 \right)</math> <math display="block">= 2\pi (3^3)</math> <math display="block">= 54\pi \text{ cm}^3</math></p>	<p>1M 1A</p>	<p>u-1 for missing unit</p>
------(4)		
<p>Note that <math>\angle ABD = 90^\circ</math> . Also note that <math>\angle COD = \angle BAD = 38^\circ</math> . Further note that <math>\angle ADB = 180^\circ - 90^\circ - 38^\circ = 52^\circ</math> . Since <math>OC = OD</math> , we have <math>\angle ODC = \angle OCD</math> . So, we have <math>\angle ODC = \frac{180^\circ - 38^\circ}{2}</math> . Therefore, we have <math>\angle ODC = 71^\circ</math> .</p> <p><math display="block">\begin{aligned} \angle BDC &amp;= \angle ODC - \angle ADB \\ &amp;= 71^\circ - 52^\circ \\ &amp;= 19^\circ \end{aligned}</math></p>	<p>1A 1M 1M 1A</p>	<p>u-1 for missing unit</p>
<p>Join <math>O</math> and <math>B</math> . Since <math>OA = OB</math> , we have <math>\angle OBA = \angle OAB = 38^\circ</math> . So, we have <math>\angle BOC = \angle OBA = 38^\circ</math> . Thus, <math>\angle BDC = \frac{1}{2} \angle BOC</math>  <math display="block">= \frac{1}{2} (38^\circ)</math> <math display="block">= 19^\circ</math></p>	<p>1A 1M 1M 1A</p>	<p>u-1 for missing unit</p>
------(4)		

Solution	Marks	Remarks
8. (a) The coordinates of $A'$ $= (5, 2)$	1A	pp-1 for missing '(' or ')'
The coordinates of $A''$ $= (2, 5)$	1A	pp-1 for missing '(' or ')'
(b) The slope of $AA'$ $= \frac{5-2}{-2-5}$ $= \frac{-3}{7}$	1M	
The slope of $OA''$ $= \frac{5-0}{2-0}$ $= \frac{5}{2}$		
Note that the product of the slope of $AA'$ and the slope of $OA''$ is not equal to $-1$ . Thus, $AA'$ is not perpendicular to $OA''$ .	1M 1A	f.t.
	----- (5)	
9. (a) $x(1+20\%) = 72$ $x = \frac{72}{1+20\%}$ $x = 60$	1M  1A	  u-1 for having unit
(b) Let $y$ be the angle subtended at the centre for the sector representing District $C$ . $y$ $= 360^\circ - 72^\circ - 120^\circ - 30^\circ - 60^\circ$ $= 78^\circ$	1M 1A	
Since the angle subtended at the centre for the sector representing District $C$ is greater than that for District $A$ , the number of traffic accidents occurred in District $A$ is not greater than that in District $C$ .	1M	
	----- (5)	

Solution	Marks	Remarks
10. (a) The quotient $= 5x + 2$	1M + 1A -----(2)	1M for division process
(b) (i) $a = 2$ and $b = -1$	1A	for both correct
(ii) $g(x) = 0$ $(5x + 2)(x^2 + 2x - 3) = 0$	1M	for using (a)
$(5x + 2)(x + 3)(x - 1) = 0$	1A	
Thus, we have $x = \frac{-2}{5}$ , $x = -3$ or $x = 1$ .	1M -----(4)	
11. (a) Let $C = as + bs^2$ , where $a$ and $b$ are non-zero constants.	1A	
$\begin{cases} a(2) + b(2^2) = 356 \\ a(5) + b(5^2) = 1250 \end{cases}$	1M	for substitution
Solving, we have $a = 130$ and $b = 24$ .	1A	for both correct
The required cost		
$= 130(6) + 24(6^2)$		
$= \$1644$	1A -----(4)	u-1 for missing unit
(b) $130s + 24s^2 = 539$		
$24s^2 + 130s - 539 = 0$	1M	
$(4s - 11)(6s + 49) = 0$		
$s = \frac{11}{4}$ or $s = \frac{-49}{6}$ (rejected)	1A	
Thus, the perimeter of the carpet is 2.75 metres.	-----(2)	u-1 for missing unit

Solution	Marks	Remarks
12. (a) Note that the slope of a line segment in the graph represents the average speed of that part of the journey. Since the slope of the line segment for Part I is the least, John drives at the lowest speed for Part I of the journey.	1M 1A -----(2)	can be absorbed
(b) Let $x$ h be the time required to drive from $B$ to $C$ . $\frac{18-4}{x} = 56$ $x = \frac{1}{4}$ Thus, John will reach $C$ at 8:26 .	1M 1A -----(2)	
(c) The average speed $= \frac{27}{\frac{30}{60}}$ $= 54 \text{ km / h}$ $= \frac{(54)(1000)}{3600}$ $= 15 \text{ m/s}$	1M 1A -----(3)	for $\frac{27}{30}$

Solution	Marks	Remarks
<p>13. (a) Note that the equation of <math>L_1</math> is <math>4x - 3y + 12 = 0</math>.</p> <p>So, the slope of <math>L_1</math> is <math>\frac{4}{3}</math>.</p> <p>Therefore, the slope of <math>L_2</math> is <math>-\frac{3}{4}</math>.</p> <p>The equation of <math>L_2</math> is</p> $y - 9 = \frac{-3}{4}(x - 4)$ $3x + 4y - 48 = 0$	<p>1M</p> <p>1M</p> <p>1A</p> <p>------(3)</p>	
<p>(b) (i) Note that <math>\Gamma</math> is the perpendicular bisector of <math>AB</math>.</p> <p>Also, <math>AB</math> is perpendicular to <math>L_2</math>.</p> <p>Thus, <math>\Gamma</math> is parallel to <math>L_2</math>.</p> <p>(ii) The slope of <math>\Gamma</math> is <math>-\frac{3}{4}</math>.</p> <p>Putting <math>x = 0</math> in <math>4x - 3y + 12 = 0</math>, we have <math>y = 4</math>.</p> <p>So, we have <math>B = (0, 4)</math>.</p> <p>Note that <math>L_2</math> cuts the <math>y</math>-axis at <math>C(0, 12)</math>.</p> <p>The mid-point of <math>BC</math> is <math>(0, 8)</math>.</p> <p>The required equation is</p> $y = -\frac{3}{4}x + 8$ $3x + 4y - 32 = 0$	<p>1M</p> <p>1A</p> <p>1M</p> <p>1A</p> <p>1M</p> <p>1A</p>	<p>accept <math>\Gamma</math> is a straight line</p>
<p>By solving <math>\begin{cases} 4x - 3y + 12 = 0 \\ 3x + 4y - 48 = 0 \end{cases}</math>, we have <math>A = \left(\frac{96}{25}, \frac{228}{25}\right)</math>.</p> <p>Putting <math>x = 0</math> in <math>4x - 3y + 12 = 0</math>, we have <math>y = 4</math>.</p> <p>So, we have <math>B = (0, 4)</math>.</p> <p>The required equation is</p> $\sqrt{(x-0)^2 + (y-4)^2} = \sqrt{\left(x - \frac{96}{25}\right)^2 + \left(y - \frac{228}{25}\right)^2}$ $3x + 4y - 32 = 0$	<p>1M</p> <p>1A</p> <p>1M</p> <p>1A</p>	<p>either one</p>
<p>The slope of <math>\Gamma</math> is <math>-\frac{3}{4}</math>.</p> <p>By solving <math>\begin{cases} 4x - 3y + 12 = 0 \\ 3x + 4y - 48 = 0 \end{cases}</math>, we have <math>A = \left(\frac{96}{25}, \frac{228}{25}\right)</math>.</p> <p>Putting <math>x = 0</math> in <math>4x - 3y + 12 = 0</math>, we have <math>y = 4</math>.</p> <p>So, we have <math>B = (0, 4)</math>.</p> <p>The mid-point of <math>AB</math> is <math>\left(\frac{48}{25}, \frac{164}{25}\right)</math>.</p> <p>The required equation is</p> $y - \frac{164}{25} = -\frac{3}{4}\left(x - \frac{48}{25}\right)$ $3x + 4y - 32 = 0$	<p>1M</p> <p>1A</p> <p>1M</p> <p>1A</p>	<p>either one</p>
	<p>------(6)</p>	

Solution	Marks	Remarks
14. (a) The median = 62%  The mean $= \frac{55\% + 58\% + 62\% + 62\% + 63\%}{5}$ = 60%	1A    1A -----(2)	
(b) (i) 58%  (ii) $a = 63$ $b = 57$	1A  1M 1M   -----(3)	1M for either one of the following conditions satisfied: (1) $a + b = 120$ (2) $\begin{cases} a \geq 62 \\ 0 \leq b < 62 \end{cases}$ or $\begin{cases} 0 \leq a < 62 \\ b \geq 62 \end{cases}$
(c) Note that the data are collected from only one magazine stall. Also note that the week may not be randomly selected. Thus, the claim is disagreed.	1M  1M	accept any suitable reason
Note that the number of magazine stall in city $H$ may be small. Also note that the stall may be randomly selected. Further note that the week may be randomly selected. Thus, the claim is agreed.	1M  1M -----(2)	accept any suitable reason

Solution	Marks	Remarks
<p>Let <math>n</math> be the number of rows of seats.</p> $\frac{n}{2}(2(12) + (n-1)3) \leq 930$ $\frac{3n^2}{2} + \frac{21n}{2} - 930 \leq 0$ $n^2 + 7n - 620 \leq 0$ $\frac{-7 - \sqrt{2529}}{2} \leq n \leq \frac{-7 + \sqrt{2529}}{2}$ <p>Therefore, the greatest value of <math>n</math> is 21 . Thus, the greatest number of rows of seats is 21 .</p>	<p>1M 1M 1A 1A</p> <p>------(4)</p>	<p>for sum of arithmetic sequence for quadratic inequality in <math>n</math> accept <math>-28.6 \leq n \leq 21.6</math></p>
<p>(a) The required probability</p> $= \frac{C_2^5 C_2^4}{C_4^9}$ $= \frac{10}{21}$	<p>1M + 1A 1A</p>	<p>1M for numerator using <math>C_2^n</math>, <math>n = 4, 5</math> 1A for denominator r.t. 0.476</p>
<p>The required probability</p> $= 6 \left( \frac{5}{9} \right) \left( \frac{4}{8} \right) \left( \frac{4}{7} \right) \left( \frac{3}{6} \right)$ $= \frac{10}{21}$	<p>1M + 1A 1A</p> <p>------(3)</p>	<p>1M for <math>\left( \frac{r}{n} \right) \left( \frac{r-1}{n-1} \right) \left( \frac{r-1}{n-2} \right) \left( \frac{r-2}{n-3} \right)</math> 1A for <math>6p</math>, <math>0 &lt; p &lt; 1</math> r.t. 0.476</p>
<p>(b) The required probability</p> $= 1 - \frac{10}{21}$ $= \frac{11}{21}$	<p>1M 1A</p>	<p>for <math>1 - (a)</math> r.t. 0.524</p>
<p>The required probability</p> $= \frac{C_4^5 + C_4^4 + C_1^5 C_3^4 + C_3^5 C_1^4}{C_4^9}$ $= \frac{11}{21}$	<p>1M 1A</p>	<p>for considering 4 cases r.t. 0.524</p>
<p>The required probability</p> $= \left( \frac{5}{9} \right) \left( \frac{4}{8} \right) \left( \frac{3}{7} \right) \left( \frac{2}{6} \right) + \left( \frac{4}{9} \right) \left( \frac{3}{8} \right) \left( \frac{2}{7} \right) \left( \frac{1}{6} \right) + 4 \left( \frac{5}{9} \right) \left( \frac{4}{8} \right) \left( \frac{3}{7} \right) \left( \frac{2}{6} \right) + 4 \left( \frac{5}{9} \right) \left( \frac{4}{8} \right) \left( \frac{3}{7} \right) \left( \frac{4}{6} \right)$ $= \frac{11}{21}$	<p>1M 1A</p> <p>------(2)</p>	<p>for considering 10 cases r.t. 0.524</p>



Solution	Marks	Remarks
<p>17. Note that <math>6.4 = \log_8 E</math> .</p> <p>Therefore, we have <math>E = 8^{6.4}</math> .</p> <p>Also note that <math>M = \log_4 E</math> .</p> <p><math>M = \log_4(8^{6.4})</math></p> <p><math>4^M = 8^{6.4}</math></p> <p><math>(2^2)^M = (2^3)^{6.4}</math></p> <p><math>2^{2M} = 2^{19.2}</math></p> <p><math>2M = 19.2</math></p> <p><math>M = 9.6</math></p> <p>Thus, the magnitude of the explosion on Scale <math>A</math> is 9.6 .</p>	<p>1A</p> <p>1A</p> <p>1M</p> <p>1M</p> <p>1A</p>	
<p><math>M</math></p> <p><math>= \log_4 E</math></p> <p><math>= \frac{\log_8 E}{\log_8 4}</math></p> <p><math>= \frac{6.4}{\log_8(8^{\frac{2}{3}})}</math></p> <p><math>= \frac{6.4}{\frac{2}{3}}</math></p> <p><math>= 9.6</math></p> <p>Thus, the magnitude of the explosion on Scale <math>A</math> is 9.6 .</p>	<p>1A</p> <p>1M + 1A</p> <p>1M</p> <p>1A</p>	<p>for denominator</p>
-----(5)		

Solution	Marks	Remarks
<p>(a) By sine formula,</p> $\frac{BC}{\sin 45^\circ} = \frac{20}{\sin 30^\circ}$ $BC = 20\sqrt{2} \text{ cm}$ $BD = 20\sqrt{2} \cos 30^\circ$ $= 10\sqrt{6} \text{ cm}$	<p>1M</p> <p>1A</p> <p>1A</p> <p>------(3)</p>	<p>accept finding <math>CD</math> and using sine twice</p>
<p>(b) (i) Note that the required angle is <math>\angle ADB</math> .</p> <p>Also note that <math>AD = 20 \cos 45^\circ = 10\sqrt{2} \text{ cm}</math> .</p> <p>By cosine formula,</p> $\cos \angle ADB = \frac{(10\sqrt{6})^2 + (10\sqrt{2})^2 - 18^2}{2(10\sqrt{6})(10\sqrt{2})}$ <p><math>\angle ADB \approx 46.60320866^\circ</math></p> <p><math>\angle ADB \approx 46.6^\circ</math></p>	<p>1A</p> <p>1M</p> <p>1A</p>	<p>accept using Pythagoras' theorem twice</p>
<p>(ii) Note that <math>AD = CD = 10\sqrt{2} \text{ cm}</math> .</p> <p>Also note that <math>\angle ADC = 90^\circ</math> .</p> <p>The volume of the tetrahedron <math>ABCD</math></p> $= \frac{1}{3} \left( \frac{1}{2} (AD)(BD) \sin \angle ADB \right) (CD)$ $= \frac{1}{3} \left( \frac{1}{2} (10\sqrt{2})(10\sqrt{6})(\sin \angle ADB) \right) (10\sqrt{2})$ $= \frac{1000\sqrt{6} \sin \angle ADB}{3}$ <p>So, the volume of the tetrahedron varies directly as <math>\sin \angle ADB</math> .</p> <p>When <math>\angle ADB</math> increases from <math>40^\circ</math> to <math>90^\circ</math> , the volume of the tetrahedron <math>ABCD</math> increases.</p> <p>When <math>\angle ADB</math> increases from <math>90^\circ</math> to <math>140^\circ</math> , the volume of the tetrahedron <math>ABCD</math> decreases.</p>	<p>1M</p> <p>1A</p>	<p>either one</p>
<p>The volume of the tetrahedron <math>ABCD</math></p> $= \frac{1}{3} (\text{The area of } \triangle ACD)(BD \sin \angle ADB)$ <p>Since the area of <math>\triangle ACD</math> and the length of <math>BD</math> are constants, the volume of the tetrahedron varies directly as <math>\sin \angle ADB</math> .</p> <p>When <math>\angle ADB</math> increases from <math>40^\circ</math> to <math>90^\circ</math> , the volume of the tetrahedron <math>ABCD</math> increases.</p> <p>When <math>\angle ADB</math> increases from <math>90^\circ</math> to <math>140^\circ</math> , the volume of the tetrahedron <math>ABCD</math> decreases.</p>	<p>1M</p> <p>1A</p>	<p>either one</p>
	<p>------(5)</p>	

Solution	Marks	Remarks
19. (a) (i) Join $C$ and $D$ . $\angle CDB = \angle CAB$ ( $\angle$ s in the same segment ) $\angle QCD = \angle CAD$ ( $\angle$ in alt segment ) $\angle QCD = \angle CDB$ ( alt. $\angle$ s , $PQ \parallel BD$ ) So, $\angle CAB = \angle CAD$ $AE = AE$ (common side) $AB = AD$ (given) $\triangle ABE \cong \triangle ABD$ (SAS)		
<b>Marking Scheme:</b>		
<b>Case 1</b> Any correct proof with correct reasons.	3	
<b>Case 2</b> Any correct proof without reasons.	2	
<b>Case 3</b> Incomplete proof with any one correct step and one correct reason.	1	
(ii) By (a)(i), $\angle CAB = \angle CAD$ . Therefore, $AC$ is the angle bisector of $\angle BAD$ . So, $AC$ must pass through the in-centre of $\triangle ABD$ . By (a)(i), $\angle AED = \angle AEB$ . Note that $\angle AED + \angle AEB = 180^\circ$ . Therefore, $\angle AED = \angle AEB = 90^\circ$ . So, $AE$ is an altitude of $\triangle ABD$ . Hence, the orthocentre of $\triangle ABD$ lies on the straight line passing through $A$ and $E$ . Also, $BE = DE$ . Therefore, $AE$ is a median of $\triangle ABD$ . So, $AC$ passes through the centroid of $\triangle ABD$ . Also note that $AC$ is the perpendicular bisector of $BD$ . So, $AC$ passes through the circumcentre of $\triangle ABD$ . Therefore, the in-centre, the orthocentre, the centroid and the circumcentre lie on the straight line passing through $A$ and $C$ . Thus, the in-centre, the orthocentre, the centroid and the circumcentre are collinear.	1A + 1A -----(6)	1A for any one correct 1A for any two correct f.t.
(b) The $x$ -coordinate of the centre of the circle is $\frac{14+4}{2} = 9$ . Let $(9, t)$ be the coordinates of the centre of the circle. $\sqrt{(9-4)^2 + (t-4)^2} = \sqrt{(9-8)^2 + (t-12)^2}$ $t = \frac{13}{2}$ The slope of the tangent $PQ$ = the slope of $BD$ $= \frac{12-4}{8-4}$ $= 2$ Let $(a, b)$ be the coordinates of $C$ . Note that $AC$ passes through the centre of the circle. Then, we have $\frac{a+14}{2} = 9$ and $\frac{b+4}{2} = \frac{13}{2}$ . So, we have $a = 4$ and $b = 9$ . The required equation is $y - 9 = 2(x - 4)$ $2x - y + 1 = 0$	1A 1M 1M 1M 1M 1M 1A	for slope formula can be absorbed for mid-point formula

Solution	Marks	Remarks
<p>The x-coordinate of the centre of the circle is <math>\frac{14+4}{2} = 9</math>.</p> <p>Let <math>(9, t)</math> be the coordinates of the centre of the circle.</p> $\sqrt{(9-4)^2 + (t-4)^2} = \sqrt{(9-8)^2 + (t-12)^2}$ $t = \frac{13}{2}$ <p>So, the equation of the circle is <math>x^2 + y^2 - 18x - 13y + 92 = 0</math>.</p> <p>The slope of the tangent <math>PQ</math>  = the slope of <math>BD</math>  <math display="block">= \frac{12-4}{8-4}</math> <math display="block">= 2</math></p> <p>Let the equation of the tangent be <math>y = 2x + k</math>, where <math>k</math> is a constant.</p> <p>Putting <math>y = 2x + k</math> in <math>x^2 + y^2 - 18x - 13y + 92 = 0</math>, we have  <math>x^2 + (2x + k)^2 - 18x - 13(2x + k) + 92 = 0</math>.</p> <p>Therefore, we have <math>5x^2 - (4k - 44)x + (k^2 - 13k + 92) = 0</math>.</p> <p>For tangency, we have <math>\Delta = 0</math>.  <math>(4k - 44)^2 - 4(5)(k^2 - 13k + 92) = 0</math>  <math>k^2 + 23k - 24 = 0</math>  <math>k = 1</math> or <math>k = -24</math> (rejected)</p> <p>Thus, the required equation is <math>2x - y + 1 = 0</math>.</p>	<p>1A</p> <p>1M</p> <p>1M</p> <p>1M</p> <p>1M</p> <p>1M</p> <p>1A</p>	<p>for slope formula</p>
<p>Let the equation of the circle be  <math>x^2 + y^2 + k_1x + k_2y + k_3 = 0</math>, where <math>k_1, k_2</math> and <math>k_3</math> are constants.</p> $\begin{cases} 14^2 + 4^2 + k_1(14) + k_2(4) + k_3 = 0 \\ 8^2 + 12^2 + k_1(8) + k_2(12) + k_3 = 0 \\ 4^2 + 4^2 + k_1(4) + k_2(4) + k_3 = 0 \end{cases}$ <p>Solving, we have <math>k_1 = -18</math>, <math>k_2 = -13</math> and <math>k_3 = 92</math>.</p> <p>So, the equation of the circle is <math>x^2 + y^2 - 18x - 13y + 92 = 0</math>.</p> <p>The slope of the tangent <math>PQ</math>  = the slope of <math>BD</math>  <math display="block">= \frac{12-4}{8-4}</math> <math display="block">= 2</math></p> <p>Let the equation of the tangent be <math>y = 2x + k</math>, where <math>k</math> is a constant.</p> <p>Putting <math>y = 2x + k</math> in <math>x^2 + y^2 - 18x - 13y + 92 = 0</math>, we have  <math>x^2 + (2x + k)^2 - 18x - 13(2x + k) + 92 = 0</math>.</p> <p>Therefore, we have <math>5x^2 - (4k - 44)x + (k^2 - 13k + 92) = 0</math>.</p> <p>For tangency, we have <math>\Delta = 0</math>.  <math>(4k - 44)^2 - 4(5)(k^2 - 13k + 92) = 0</math>  <math>k^2 + 23k - 24 = 0</math>  <math>k = 1</math> or <math>k = -24</math> (rejected)</p> <p>Thus, the required equation is <math>2x - y + 1 = 0</math>.</p>	<p>1A</p> <p>1M</p> <p>1M</p> <p>1M</p> <p>1M</p> <p>1M</p> <p>1A</p>	<p>for solving</p> <p>for slope formula</p>

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Paper 2

Question No.	Key	Question No.	Key
1.	C	31.	B
2.	C	32.	D
3.	C	33.	A
4.	A	34.	A
5.	C	35.	D
6.	D	36.	C
7.	D	37.	C
8.	A	38.	A
9.	C	39.	A
10.	A	40.	C
11.	C	41.	B
12.	B	42.	B
13.	D	43.	D
14.	C	44.	B
15.	B	45.	D
16.	B		
17.	A		
18.	B		
19.	A		
20.	A		
21.	B		
22.	C		
23.	B		
24.	D		
25.	A		
26.	D		
27.	D		
28.	B		
29.	D		
30.	B		