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Solution	Marks	Remarks
1. (a) $x = \frac{y-3}{2}$ (or $\frac{y-3}{2}$ ) (b) $(a+b)(x+2y)$ (c) $4\sqrt{3}$ (d) (i) 50 (ii) 65 (iii) 60	1A  1A 1A 1A 1A 1A <hr/> 6	No mark if parenthesis is missed   In (d), accept ans. written in order
2. (a) $\frac{3\pi}{4}$ (or $0.75\pi$ ) (b) 144 (c) 216 (d) $5\pi$ (or 15.7) (e) 8 : 27 (不接, 紙 = 7:8) (or 1:3.38, 0.296:1, $2^3:3^3$ )	1A  1A 1A 1A 1A <hr/> 5	r.i. 15.7 Accept $\frac{8}{27}$ etc. r.t 3 sig. fig.
3. $(k+3)(k-2)+2 = k^2$ $k^2+k-4 = k^2$ $k = 4$	1A 1A 1A	
OR by long division, $[(x+3)(x-2)+2] + (x-k) = (x+k+1) \dots (k^2+k-4)$ $\therefore k^2+k-4 = k^2$ $k = 4$	<del>1A</del> <del>1A</del> 1A	
	<hr/> 3	
(a) $x = k\frac{y^2}{z}$ (for some constant $k \neq 0$ ) $54 = k\frac{3^2}{10}$ $k = 60$ $\therefore x = 60\frac{y^2}{z}$	1A  1A	
(b) When $y = 5, z = 12,$ $x = \frac{60 \times 5^2}{12} = 125$	1A	
OR $\frac{54 \cdot 10}{3^2} = \frac{x \cdot 12}{5^2}, x = 125$	1A	
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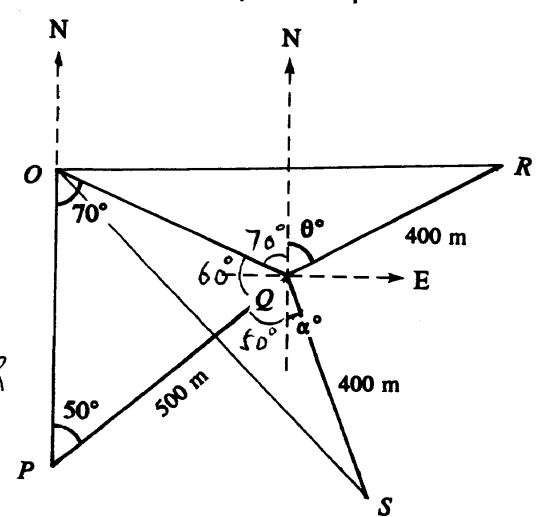
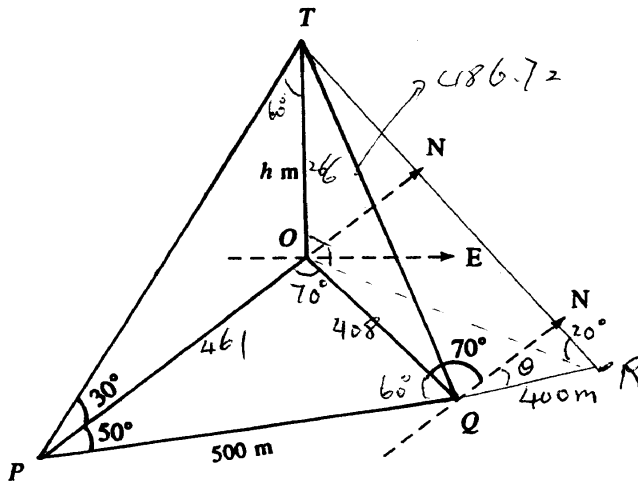
Solution	Marks	Remarks
15. (a) (i) The number of babies born in Hong Kong in the first year after 1994 $= 70000 \times 1.02$ $= 71400$	1A	
(ii) The number of babies born in Hong Kong in the $n$ th year after 1994 $= 70000 (1.02)^n$ or $71400 \times 1.02^{n-1}$	1A	Accept $70000(1+20\%)^n$
(b) If $70000 (1.02)^n > 90000$ then $n \log(1.02) > \log\left(\frac{9}{7}\right)$	1M	Accept using $=, \geq, \leq, <$
$n > 12.69$ $\therefore$ In the 13th year after 1994, the number of babies born in Hong Kong will exceed 90000. i.e. In the year 2007.	1M	For taking logarithm, may be absorbed by $n=13$ or $n>12.7$ in what follows
(c) The total number of babies born in Hong Kong in the years 1997 to 2046 inclusive $= 70000 (1.02^3 + 1.02^4 + \dots + 1.02^{52})$ $= 70000 (1.02)^3 (1 + 1.02 + 1.02^2 + \dots + 1.02^{49})$ $= 70000 (1.02)^3 \left( \frac{1.02^{50} - 1}{1.02 - 1} \right)$ $= 6282944$ $\approx 6280000$	1M + 1A	1M for sum of G.P. 要出現 70000 及 1.02
(d) (i) The leap years between 1997 to 2046 are 2000, 2004, ..., 2044. Number of leap years $= \frac{2044 - 2000}{4} + 1$ $= 12$	1A	
(ii) $70000 (1.02^6 + 1.02^{10} + \dots + 1.02^{50})$ $= 70000 (1.02)^6 (1 + 1.02^4 + \dots + 1.02^{44})$ $= 70000 (1.02)^6 \frac{(1.02)^{4 \times 12} - 1}{(1.02)^4 - 1}$ $= 1517744$ $\approx 1520000$	1M + 1A	1M for sum of G.P. 要出現 1.02 及 1.02 之次方 及 4 之倍數

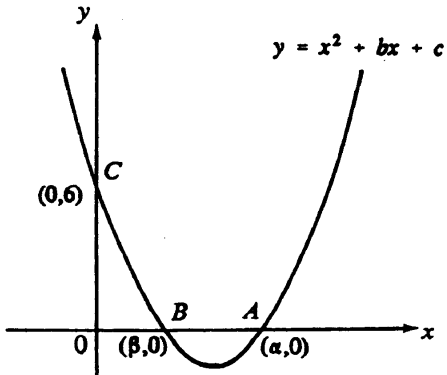
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Solution	Marks	Remarks
5. (a) $BE = \sqrt{1^2 + 2^2} = \sqrt{5}$ (or 2.24)	1A	r.t. 2.24
(b) $\tan x^\circ = \frac{1}{2}$ (or $\sin x^\circ = \frac{1}{\sqrt{5}}$ ) $x \approx 26.57$ $\approx 26.6$	1A	
$\tan \angle EBC = 2$ , $\angle EBC = 63.43^\circ$ $y \approx 63.43 - 26.57$ $\approx 36.9$	1A	r.t. 26.6; accept 26°34'
	$\frac{1A}{4}$	r.t. 36.9 accept 36°52'
6. (a) Selling Price = \$ $x(1+70\%)(1-5\%)$ Percentage gain = $\frac{(1.7)(0.95)x - x}{x} \times 100\%$ $= 61.5\%$	1A 1M 1A	
OR $(1+70\%)(1-5\%) - 1$ $= 61.5\%$	1A + 1M 1A	
(b) $x = \frac{2907}{(1+61.5\%)}$ $= 1800$	1M $\frac{1A}{5}$	

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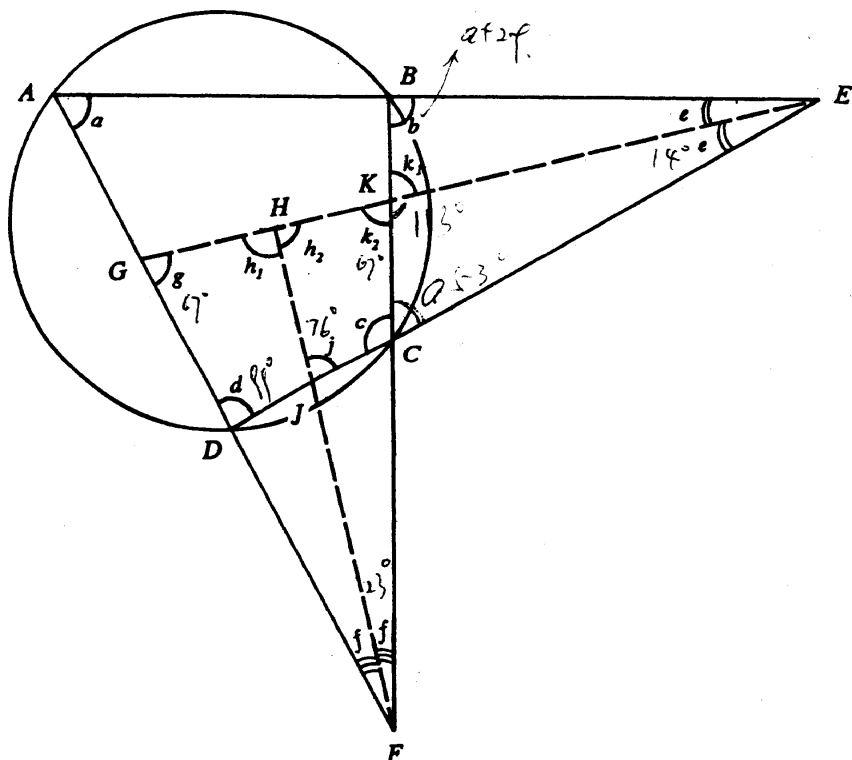
Solution	Marks	Remarks
14. (a) $\frac{OQ}{\sin 50^\circ} = \frac{500}{\sin 70^\circ} = \frac{OP}{\sin 60^\circ}$ $OQ = \frac{500 \sin 50^\circ}{\sin 70^\circ} \approx 407.60 \text{ (m)}$ $\approx 408 \text{ (m)}$ $OP = \frac{500 \sin 60^\circ}{\sin 70^\circ} \approx 460.80 \text{ (m)}$ $\approx 461 \text{ (m)}$	1A  1A  1A	For either  r.t. 408  r.t. 461
(b) $h = OP \tan 30^\circ$ $\approx (460.80) \tan 30^\circ$ $\approx 266$	1M 1A	(不必代OP之值) r.t. 266
(c) $\tan \angle TQO = \frac{h}{OQ} = \frac{266.044}{407.6} \approx 0.6527$ $\angle TQO \approx 33.1^\circ \approx 33^\circ$	1M 1A	(不必代OR之值)
(d) (i) $OR = \frac{h}{\tan 20^\circ} \approx 730.95 \approx 731 \text{ (m)}$ $\cos \angle OQR = \frac{(OQ)^2 + (QR)^2 - (OR)^2}{2(OQ)(QR)}$ $= \frac{(407.60)^2 + (400)^2 - (730.95)^2}{2(407.60)(400)}$ $\approx -0.6383$ $\angle OQR = 129.66^\circ \approx 130^\circ$ $\theta = 130 - 70$ $= 60$	1M  1A  1A	(不必代OQ, QR, OR之值)  r.t. 130
(ii) By symmetry, $\triangle OQR \cong \triangle OQS$ , $\therefore \angle OQR = \angle OQS$ $\alpha + 50 + 60 = 130$ $\alpha = 20$ The bearing of S from Q is S20°E (or 160°)	1M  1A	



Solution	Marks	Remarks
7. (a) $\frac{(a^4b^{-2})^2}{ab} = \frac{a^8b^{-4}}{ab}$ $= \frac{a^8}{ab^{1+4}}$ } (容許跳一步) $= \frac{a^7}{b^5}$	1M	For applying $(a^m b^n)^p = a^{mp} b^{np}$
	1M	For applying $a^{-n} = \frac{1}{a^n}$
	1A	
(b) $\log\sqrt{12} = \frac{1}{2}(\log 12)$	1M	For applying $\log x^n = n \log x$
$= \frac{1}{2}(\log 4 + \log 3)$	1M	For applying $\log xy = \log x + \log y$
$= \frac{2x+y}{2}$ (or $x + \frac{y}{2}$ )	1A	
	6	
2. (a) $c = 6$ $\alpha\beta = c = 6$	1A	
	1A	
(b) $\alpha + \beta = -b$	1A	Accept $-\frac{b}{1}$
(c) $(\alpha - \beta)^2 = \alpha^2 + \beta^2 - 2\alpha\beta$ $= (\alpha + \beta)^2 - 4\alpha\beta$ $= b^2 - 24$	1A	
	1A	
Area of $\triangle ABC = \frac{1}{2}(AB)(OC)$ (or $\frac{1}{2} \begin{vmatrix} 0 & 6 \\ \beta & 0 \\ \alpha & 0 \\ 0 & 6 \end{vmatrix}$ )		
$= \frac{6}{2}(\alpha - \beta)$	<del>3A</del>	
$= 3\sqrt{b^2 - 24}$	4+1A	
	7	
		

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Solution	Marks	Remarks
13. (c)(ii) $\because \angle EKC = h_2 + f, \quad c = \angle EKC + e$ $\therefore \angle EKC = 90^\circ + 23^\circ = 113^\circ$ $c = 113^\circ + 14^\circ$ $= 127^\circ$	1M  2A	For either
OR $\because c = b + 2e, \quad b = a + 2f$ $\therefore c = a + 2f + 2e = a + 74^\circ$ $\because a + c = 180^\circ$ $\therefore c = (180^\circ - c) + 74^\circ$ $= 127^\circ$	1M  2A	For either
OR $g = 180^\circ - f - h_1$ $= 180^\circ - 23^\circ - 90^\circ = 67^\circ$ $d = 180^\circ - g - e$ $= 180^\circ - 67^\circ - 14^\circ = 99^\circ$ $c = 2f + 180^\circ - d$ $= 46^\circ + 180^\circ - 99^\circ$ $= 127^\circ$	1M  2A	
OR $\because 2a + 2e + 2f = 180^\circ$ $\therefore a = 90^\circ - 14^\circ - 23^\circ = 53^\circ$ $c = 180^\circ - a = 180^\circ - 53^\circ$ $= 127^\circ$	1M  2A	



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Solution	Marks	Remarks
9. (a) (i) The probability that he will be late on all the three days $= \left(\frac{1}{7}\right)^3 \quad \left(\text{or } \frac{1}{7} \times \frac{1}{7} \times \frac{1}{7}\right)$ $= \frac{1}{343} \quad \left(\text{or } 0.00292\right)$	1A  1A	  r.t. 0.00292
(ii) The probability that he will not be late on all the three days $= \left(1 - \frac{1}{7}\right)^3$ $= \frac{216}{343} \quad \left(\text{or } 0.630\right)$	1M  1A	$(1-p)^3$ , $p$ in a(i)  r.t. 0.630
(b) (i) The probability that he will be late on Thursday and Friday only $= \frac{1}{10} \times \frac{1}{10} \times \left(1 - \frac{1}{10}\right)$ $= \frac{9}{1000} \quad \left(\text{or } 0.009\right)$	1A  1A	
(ii) The probability that he will be late on any two of the three days $= \frac{1}{10} \times \frac{1}{10} \times \left(1 - \frac{1}{10}\right) + \frac{1}{10} \times \left(1 - \frac{1}{10}\right) \times \frac{1}{10} + \left(1 - \frac{1}{10}\right) \times \frac{1}{10} \times \frac{1}{10}$ $\left(\text{or } 3 \times \frac{9}{1000}\right)$ $= \frac{27}{1000} \quad \left(\text{or } 0.027\right)$	1M  1A	$3p$ , $p$ in (b)(i)
(c) The probability that he will be late for school on Sunday $= \frac{1}{2} \times \frac{1}{7} + \frac{1}{2} \times \frac{1}{10}$ $= \frac{17}{140} \quad \left(\text{or } 0.121\right)$	1A  1M 1A 1A	For the value $\frac{1}{2}$  For $P_1 + P_2$  For the whole expression  r.t. 0.121

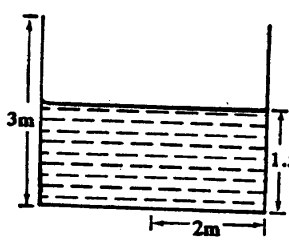
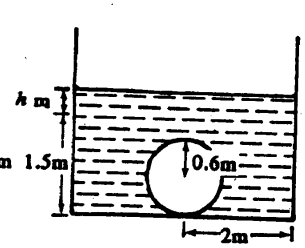
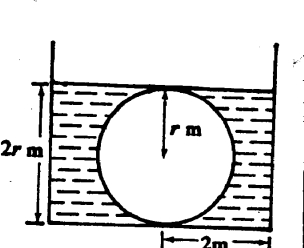
全無解釋 PP-1

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Solution	Marks	Remarks	
13. (a) In $\triangle BKE$ , $b + e + k_1 = 180^\circ$ $k_1 = 180^\circ - b - e$ Similarly, in $\triangle GDE$ , $g = 180^\circ - d - e$ $\therefore b = d$ $\therefore k_1 = g$ $\therefore k_1 = k_2$ $\therefore g = k_2$ i.e. $\angle FGH = \angle FKH$	( $\angle$ sum of $\Delta$ )           ( ext. $\angle$ , cyclic quad. )     ( vert. opp $\angle$ s )	1           1       1	三角形內角和   接納 ext. $\angle$ , cyclic quad. 接納 ext. $\angle$ , cyclic quad. 圓內接四邊形外角 ext. $\angle$ = int. opp. $\angle$  對頂角 不接納 } } opp. $\angle$ } vert. $\angle$ 接納 opp. vert. $\angle$
(b) In $\triangle FHG$ , $h_1 + f + g = 180^\circ$ $h_1 = 180^\circ - f - g$ Similarly, in $\triangle FHK$ , $h_2 = 180^\circ - f - k_2$ $\therefore g = k_2$ $\therefore h_1 = h_2$ $\therefore h_1 + h_2 = 180^\circ$ $\therefore 2h_1 = 180^\circ$ $h_1 = 90^\circ$ i.e. $FH \perp GK$	( $\angle$ sum of $\Delta$ )   ( $180^\circ - f - k_2$ )     ( proved )  ( $h_1 = h_2$ )  ( adj. $\angle$ s on st. line )	1A           1A      1	直線上的鄰角和 接納 LS on ab. line L sum on st. line L sum on the line 接納 adj. LS.
(c)(i) In $\triangle EHJ$ , $h_1 = j + e$ $j = h_1 - e$ $= 90^\circ - e$ In $\triangle FHG$ , $g + h_1 + f = 180^\circ$ $g = 180^\circ - h_1 - f$ $= 180^\circ - 90^\circ - f$ $= 90^\circ - f$ $\therefore \angle AED = \angle AFB$ $2e = 2f$ $e = f$ $\therefore j = g$ Hence, $D, J, H, G$ are concyclic.	( ext. $\angle$ of $\Delta$ )  ( or ext. $\angle$ )        ( $\angle$ sum of $\Delta$ )           ( Given )     ( ext. $\angle$ of quad. equal ) ( ext. $\angle$ = int. opp. $\angle$ )	1              1A           1	三角形外角                外角=內對角 Converse of ext. $\angle$ , cyclic quad. 圓內接四邊形外角的逆定理

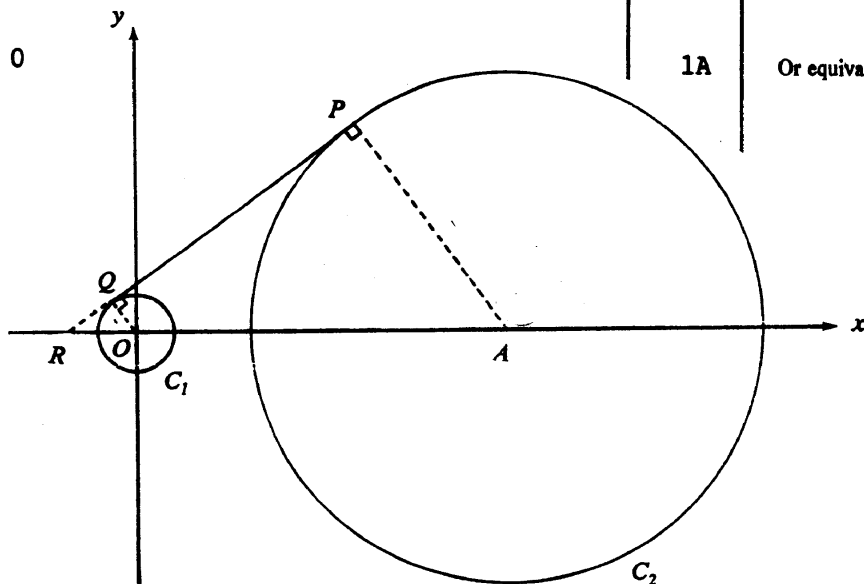


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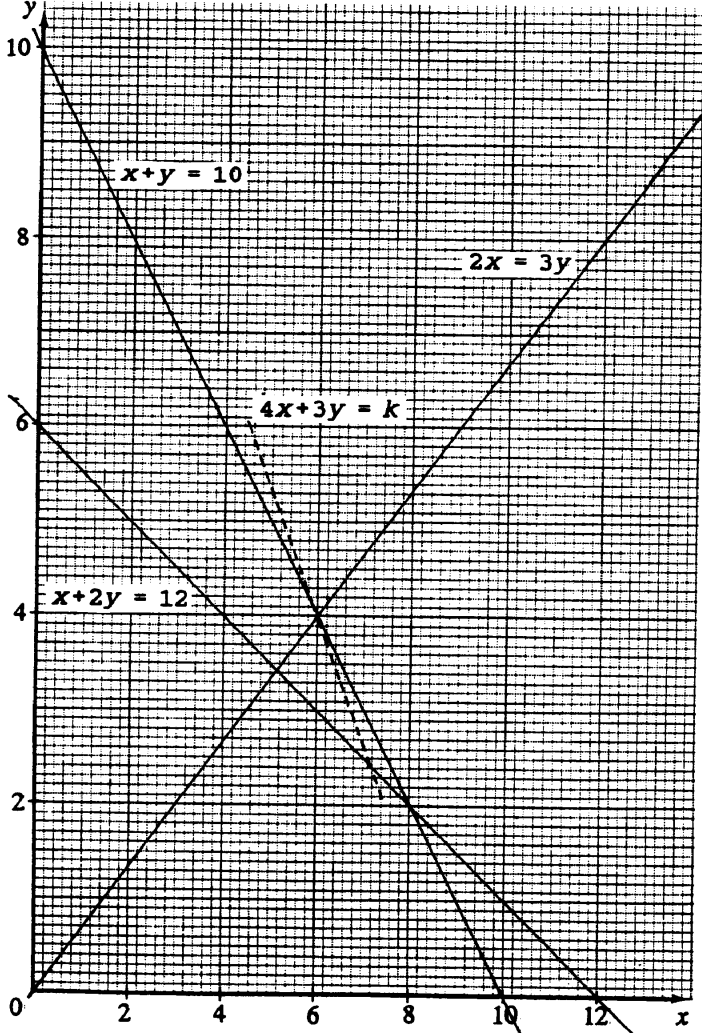
Solution	Marks	Remarks																											
<p>10. (a) volume of water = <math>\pi(2)^2(1.5) \text{ m}^3</math>  <math>= 6\pi \text{ m}^3</math></p>	1A																												
<p>(b) <math>\pi(2)^2 h = \frac{4}{3}\pi(0.6)^3</math>  <math>h = 0.072</math> or <math>\frac{9}{125}</math> (要約至最簡)</p>	1M + 1A 1A	1M for an equation in $h$ (any equation involving)																											
<p>(c) <math>\frac{4}{3}\pi r^3 + 6\pi = \pi(2)^2(2r)</math>   <math>2r^3 - 12r + 9 = 0</math></p>	1M + 1A  1	1M for an equation in $r$ in the form of $x+y=z$ , or equivalent, with exactly 2 terms in $r$  f.t.																											
<p>Let <math>f(r) = 2r^3 - 12r + 9 = 0</math> (or <math>r^3 - 6r + 4.5</math>) (or <math>2r^3 - 12r + 9 = 0</math>) (PP-1)  <math>f(0.6) \approx 2.23 &gt; 0</math>  <math>f(1) = -1 &lt; 0</math>  <math>\therefore f(r) = 0</math> has a root between 0.6 and 1</p>	1M	Testing that the signs are different																											
<table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="width: 30%;">Interval</th> <th style="width: 30%;">mid-value (<math>r_i</math>)</th> <th style="width: 40%;">f(<math>r_i</math>)</th> </tr> </thead> <tbody> <tr> <td><math>0.6 &lt; r &lt; 1</math></td> <td style="text-align: center;">0.8</td> <td style="text-align: center;">+ve (0.424)</td> </tr> <tr> <td><math>0.8 &lt; r &lt; 1</math></td> <td style="text-align: center;">0.9</td> <td style="text-align: center;">-ve (-0.342)</td> </tr> <tr> <td><math>0.8 &lt; r &lt; 0.9</math></td> <td style="text-align: center;">0.85</td> <td style="text-align: center;">+ve (0.0283)</td> </tr> <tr> <td><math>0.85 &lt; r &lt; 0.9</math></td> <td style="text-align: center;">0.875</td> <td style="text-align: center;">-ve (-0.160)</td> </tr> <tr> <td><math>0.85 &lt; r &lt; 0.875</math></td> <td style="text-align: center;">0.8625</td> <td style="text-align: center;">-ve (-0.0668)</td> </tr> <tr> <td><math>0.85 &lt; r &lt; 0.8625</math></td> <td style="text-align: center;">0.85625</td> <td style="text-align: center;">-ve (-0.0195)</td> </tr> <tr> <td><math>0.85 &lt; r &lt; 0.85625</math></td> <td style="text-align: center;">0.853125</td> <td style="text-align: center;">+ve (0.00435)</td> </tr> <tr> <td><math>0.853125 &lt; r &lt; 0.85625</math></td> <td style="text-align: center;">0.8546875</td> <td style="text-align: center;">-ve (-0.00757)</td> </tr> </tbody> </table>	Interval	mid-value ( $r_i$ )	f( $r_i$ )	$0.6 < r < 1$	0.8	+ve (0.424)	$0.8 < r < 1$	0.9	-ve (-0.342)	$0.8 < r < 0.9$	0.85	+ve (0.0283)	$0.85 < r < 0.9$	0.875	-ve (-0.160)	$0.85 < r < 0.875$	0.8625	-ve (-0.0668)	$0.85 < r < 0.8625$	0.85625	-ve (-0.0195)	$0.85 < r < 0.85625$	0.853125	+ve (0.00435)	$0.853125 < r < 0.85625$	0.8546875	-ve (-0.00757)	1M + 1A  1M	1M for testing sign at mid-value 1A for the correct sign of the function at mid-value  1M for the correct choice of the next interval
Interval	mid-value ( $r_i$ )	f( $r_i$ )																											
$0.6 < r < 1$	0.8	+ve (0.424)																											
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$0.85 < r < 0.85625$	0.853125	+ve (0.00435)																											
$0.853125 < r < 0.85625$	0.8546875	-ve (-0.00757)																											
<p><math>\therefore 0.853125 &lt; r &lt; 0.8546875</math>   The value of <math>r</math> correct to 2 decimal places is 0.85.</p>	1A	Check whether it is bounded by the last interval																											
<div style="display: flex; justify-content: space-around; align-items: flex-end; margin-top: 20px;">    </div>																													

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Solution	Marks	Remarks
12. (a) $A = (10, 0)$ radius of $C_2 = 7$	1A 1A	pp-1 if parenthesis is missed Accept $x=10, y=0$
(b) $\because \triangle OQR \sim \triangle APR$ (頂角及必對角) $\frac{7}{1} = \frac{10+OR}{OR}$ $OR = \frac{5}{3}$	1M 1A	Or equating ratios involving $OR$
Hence the x-coordinate of $R = -\frac{5}{3}$ (給出最簡) (接納 -1.67, 以後之答 不入接納之此處之 誤差)	1A	pp-1 if writing $R = -\frac{5}{3}$ pp-1 if $R = (-\frac{5}{3}, 0)$
(c) $QR = \sqrt{(\frac{5}{3})^2 - 1^2} = \frac{4}{3}$ Slope of $QP = \tan \angle ORQ$ $= \frac{OQ}{QR} = \frac{3}{4}$ (or 0.75)	1A	
OR $\sin \angle ORQ = \frac{OQ}{OR} = \frac{3}{5}$ slope of $QP = \tan \angle ORQ$ $= \frac{\frac{3}{5}}{\sqrt{1 - (\frac{3}{5})^2}}$ $= \frac{3}{4}$ (or 0.75)	1A 1A	
(d) The external common tangent $QP$ has equation $\frac{y-0}{x+\frac{5}{3}} = \frac{3}{4}$ $3x - 4y + 5 = 0$	1M + 1A 1A	1M for point-slope form Or equivalent
(e) The external common tangent with negative slope has slope = $-\frac{3}{4}$ equation: $\frac{y-0}{x+\frac{5}{3}} = -\frac{3}{4}$ $3x + 4y + 5 = 0$	1M 1A	Or equivalent



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<p>11. (a)</p> 	<p>1A 1A 1A</p>	<p>For the line <math>x+y=10</math> For the line <math>x+2y=12</math> For the line <math>2x=3y</math> Accept broken lines</p> <p><i>x-intercept 及 y-intercept 误差 超通一本</i></p> <p><i>缺等式或写错 label 扣一分</i></p>
<p>(b) (i) <math>2x+2y \geq 20</math> (or <math>x+y \geq 10</math>) <math>2x \geq 3y</math> <math>x+2y \geq 12</math></p> <p><math>y &gt; 0</math> (or <math>x &gt; 0, y &gt; 0</math>)</p> <p>(ii) Total payment, <math>P</math>, in \$ is <math>P = 300(x+2y) + 500x</math> <math>= 800x + 600y</math></p> <p>By drawing parallel lines of <math>4x + 3y = 0</math>,</p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>OR <math>P(6,4)=7200, P(8,2)=7600</math> <math>P(12,0)=9600</math></p> </div> <p><math>P</math> is minimum when <math>x=6, y=4</math> <math>\therefore</math> The total payment is minimum when the length is 6 m and the width is 4 m</p> <p>Minimum total payment = <math>\\$(800 \times 6 + 600 \times 4)</math> <math>= \\$ 7200</math></p>	<p>1A 1A 1A  1A  1A  1A + 1A  1A + 1A  1A  1A</p>	<p>-1 for any strict inequality</p> <p>Accept <math>x \geq 0, y \geq 0</math>; go through</p> <p>Ignore unit</p> <p>Must shown on the graph paper</p> <p>1M for substituting 1 point Optional</p> <p>(14-5)</p>