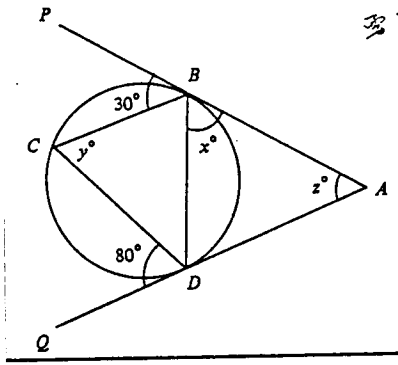
SOLUTION STEPS	MARKS	NOTES
SECTION A		
1. Let $f(x) = 3x^2 - kx - 2$		
$f(k) = 3k^2 - k^2 - 2$	1M	For sub. $x = k$
$= 2k^2 - 2$	1A	
$2k^2 - 2 = 0$	1M	Remainder = 0
$k = 1$ or -1	1A+1A	
ALTERNATIVELY,		
By long division,	1M	Divisor must be corre
$f(x) = (3x + 2k)(x - k) + (2k^2 - 2)$		
remainder $= 2k^2 - 2$	1A	
$2k^2 - 2 = 0$	1M	
$k = 1$ or -1	1A+1A	
2. Total Marks $= (1)(10)+(2)(10)+(3)(5)+(4)(20)+(5)(x)$		
$= 125 + 5x$	1A	
Total number of students $= 10 + 10 + 5 + 20 + x$		
$= 45 + x$	1A	
$\frac{125 + 5x}{45 + x} = 3$	1M	Awarded only when the appropriate data are given in numerator a denominator.
$125 + 5x = (45 + x)3$		
$2x = 10$		
$x = 5$	2A	
3. (Syl A only)		
$(1 + \sqrt{2})^4$		
$= 1 + 4\sqrt{2} + 6(\sqrt{2})^2 + 4(\sqrt{2})^3 + (\sqrt{2})^4$	2A	ALTERNATIVELY,
$= 1 + 4\sqrt{2} + 12 + 8\sqrt{2} + 4$	2A	$(1 + \sqrt{2})^4$
$= 17 + 12\sqrt{2}$	1A	$= (1 + 2\sqrt{2} + 2)^2$
		$= (3 + 2\sqrt{2})^2$ 2.
		$= (9 + 12\sqrt{2} + 8)$ 2.
		$= 17 + 12\sqrt{2}$ 1.
(Syl B only)		
(a) 15 (minutes)	3A	For wrong units, withhold 1 mark for whole question.
(b) 8 (km)	2A	
4. (a) $x^2y + 2xy + y$		ALTERNATIVELY,
$= y(x^2 + 2x + 1)$	1A	$x^2y + 2xy + y$
$= y(x + 1)^2$	2A	$= (yx + y)(x + 1)$ 2.
		$= y(x + 1)^2$ 1.
(b) $x^2y + 2xy + y - y^3$		
$= y(x^2 + 2x + 1 - y^2)$	1A	
$= y[(x + 1)^2 - y^2]$		
$= y(x + 1 - y)(x + 1 + y)$	2A	

SOLUTION STEPS	MARKS	NOTES
		
$\angle CBD = 80°$	2A	
$x = 180 - 80 - 30$		
$= 70$	1A	
$y = 70$	1A	
$z = 180 - 70 - 70$		
$= 40$	2A	
$x - 5\sqrt{x} - 6 = 0$		ALTERNATIVELY,
$x - 6 = 5\sqrt{x}$	1A	$x - 5\sqrt{x} - 6 = 0$
$(x - 6)^2 = 25x$	1M	$(\sqrt{x})^2 - 5\sqrt{x} - 6 = 0$ 1M
$x^2 - 37x + 36 = 0$	1A	$(\sqrt{x} - 6)(\sqrt{x} + 1) = 0$ 2A
$(x - 1)(x - 36) = 0$		$\sqrt{x} = 6$ or -1 1A
$x = 1$ or 36	1A+1A	rejecting $\sqrt{x} = -1$ 1A
After checking,		$x = 36$ 1A
$x = 1$ is rejected.	1A	
$\therefore x = 36$		
(a) $\tan\theta = \frac{1 + \cos\theta}{\sin\theta}$		
$\frac{\sin^2\theta}{\cos\theta} = 1 + \cos\theta$	1M	For sub $\tan\theta = \frac{\sin\theta}{\cos\theta}$
$\frac{1 - \cos^2\theta}{\cos\theta} = 1 + \cos\theta$	1M	For sub $\sin^2\theta = 1 - \cos^2\theta$
$2\cos^2\theta + \cos\theta - 1 = 0$	1A	
(b) $(2\cos\theta - 1)(\cos\theta + 1) = 0$ or $\cos\theta = \frac{-1 \pm \sqrt{1^2 - 4(-1)(2)}}{2(2)}$	1A	
$\cos\theta = \frac{1}{2}$ or -1	1A	Accept $\cos\theta = \frac{1}{2}$.
$\theta = 60°$	1A	Accept $\theta = 60$. Do not accept $\theta = \frac{\pi}{3}$.
General solution, do not award the last mark. If 2 or more answers given, do not award the last mark.		

SOLUTION STEPS	MARKS	NOTES
(a) (2 marks)		
$\frac{y-10}{x-0} = \frac{0-10}{10-0}$	1M	If a candidate wrote $\frac{x}{10} + \frac{y}{10} = 1$ 2A
l_3 : $x + y - 10 = 0$ or $x + y = 10$	1A	
(b) (3 marks) Accept $\frac{3}{2}$		
A : $(1, 1\frac{1}{2})$	1A	If a candidate did not name the points in the the answer, deduct 1 mark as pp.
B : $(4, 6)$	1A	
C : $(8\frac{1}{2}, 1\frac{1}{2})$	1A	
(c) (3 marks)		
$2y \geq 3$	1A	If equality sign omitted, deduct 1 mark from the marks scored in this part.
$x + y - 10 \leq 0$	1A	
$3x \geq 2y$	1A	If a candidate gave (e.g. $x \geq 0$, $y \geq 0$) 1 or 2 extra ineq. ..-1, 3 extra ineq. .....-2, more than 3 extra....-3.
(d) (4 marks)		
$P(1, 1\frac{1}{2}) = 1 + 3 - 5 = -1$		
$P(4, 6) = 4 + 12 - 5 = 11$	2M	Accept graphical method.
$P(8\frac{1}{2}, 1\frac{1}{2}) = \frac{17}{2} + 3 - 5 = 6.5$		
Maximum of P = 11	1A	沒有答案給 2A.
Minimum of P = -1	1A	

SOLUTION STEPS	MARKS	NOTES
9. (a) (6 marks)		
Sub. $y = k - x$ in $x^2 + y^2 = 4$	1M	
$x^2 + (k - x)^2 = 4$		
$2x^2 - 2kx + k^2 - 4 = 0 \ldots (*)$	1A	
$(-2k)^2 - 8(k^2 - 4) = 0$	1M	For $\Delta = 0$
$4k^2 - 8k^2 + 32 = 0$		
$4k^2 = 32$		
$k^2 = 8$	1A	Accept any figure which can be rounded to 2.8 or -2.8
$k = \sqrt{8}$ or $-\sqrt{8}$	1A+1A	
$= 2\sqrt{2}$ or $-2\sqrt{2}$		
ALTERNATIVELY, Distance from (0, 0) to L = $\pm \frac{k}{\sqrt{1^2 + 1^2}}$	1M+1A	1M for distance formula 1A for ±
Radius of C = 2	1A	
$\pm \frac{k}{\sqrt{1^2 + 1^2}} = 2$	1M	
$k = 2\sqrt{2}$ or $-2\sqrt{2}$ ($\sqrt{8}$ or $-\sqrt{8}$)	1A+1A	
(b) (6 marks)		
(i) Sub. (2,0) in $y = k - x$ or $x = 2$ in (*)	1M	← 可 omitted
$k = 2$	1A	2 沒有答案給 1A only
From (*), $2x^2 - 4x = 0$		
$x = 2$ or 0		
B = (0,2)	1A	
(ii) Centre = (1, 1)		
Radius = $\sqrt{(2-1)^2 + 1^2} = \sqrt{2}$	1A	Both must be correct
$(x - 1)^2 + (y - 1)^2 = 2$ Eqn. 沒有不扣分	1M+1A	
ALTERNATIVELY, $\frac{y-2}{x-0} \cdot \frac{y-0}{x-2} = -1$	1M+1A	1M for product of slopes = -1
$y^2 - 2y = -(x^2 - 2x)$		
$x^2 + y^2 - 2x - 2y = 0$	1A	

SOLUTION STEPS	MARKS	NOTES
10. (a) (2 marks)		
a, -2, b in G.P.		
$\frac{-2}{a} = \frac{b}{-2}$ or $(-2)^2 = ab$	1A	This can be omitted.
$ab = 4$	1A	
(b) (5 marks)		
-2 , b , a in A.P.		
$b + 2 = a - b$ $a = 2b + 2$	1A	
Sub. in $ab = 4$, $2(b + 1)b = 4$	1M	ALTERNATIVELY, $a(\frac{a-2}{2}) = 4$
$b^2 + b - 2 = 0$	1A	$a^2 - 2a - 8 = 0$ 1A
$(b - 1)(b + 2) = 0$		$(a - 4)(a + 2) = 0$
$b = 1$ or -2 (Accept $b = 1$)	1A	$a = 4$ or -2 1A
$b = 1$ $a = 4$	1A	$a = 4$ $b = 1$ 1A
(c) (5 marks)		
(i) For the G.P. 4, -2, 1, ...		
common ratio $= -\frac{1}{2}$	1M	
Sum $= \frac{4}{1 - (-\frac{1}{2})}$	1M	For $S = \frac{a}{1 - r}$
$= \frac{8}{3}$	1A	
(ii) For the G.P. 4, 1, $\frac{1}{4}$, ...		
common ratio $= \frac{1}{4}$	1M	
Sum $= \frac{4}{1 - \frac{1}{4}}$		
$= \frac{16}{3}$	1A	

SOLUTION STEPS	MARKS	NOTES
		Intermediate steps may be omitted.
11. (a) (6 marks)		
(i) P (both balls are red)		
$= \frac{1}{3} \times \frac{1}{3}$	1A	
$= \frac{1}{9}$	1A	or any figure which can be rounded to 0.11
(ii) P (two balls of the same colour)		
$= 3 \times \frac{1}{9}$ or $\frac{1}{3} \times \frac{1}{3} + \frac{1}{3} \times \frac{1}{3} + \frac{1}{3} \times \frac{1}{3}$	1M	For 3 x p or $p_1+p_2+p_3$
$= \frac{1}{3}$	1A	or 0.33
(iii) P (two balls of different colurs)		
$= 1 - \frac{1}{3}$ or $\frac{1}{3} \times \frac{2}{3} + \frac{1}{3} \times \frac{2}{3} + \frac{1}{3} \times \frac{2}{3}$	1M	For 1-p or $p_1+p_2+p_3$
$= \frac{2}{3}$	1A	or 0.66 to 0.67
(b) (6 marks)		
(i) P (both balls are red)		
$= \frac{2}{7} \times \frac{2}{7}$	1A	
$= \frac{4}{49}$	1A	or 0.081 to 0.082
(ii) P (two balls of the same colour)		
$= \frac{2}{7} \times \frac{2}{7} \times 2 + \frac{3}{7} \times \frac{3}{7}$	1M	For $p_1+p_2+p_3$
$= \frac{17}{49}$	1A	or 0.34 to 0.35
(iii) P (two balls of different colours)		
$= 1 - \frac{17}{49}$ or $\frac{2}{7} \times \frac{5}{7} + \frac{2}{7} \times \frac{5}{7} + \frac{3}{7} \times \frac{4}{7}$	1M	For 1-p or $p_1+p_2+p_3$
$= \frac{32}{49}$	1A	or 0.65 to 0.66
If "required probability" or "P" omitted in all parts, deduct one mark as pp.		

SOLUTION STEPS	MARKS	NOTES
(i) For answers without units, do not deduct marks. (ii) For answers with wrong units, deduct at most one mark from the marks scored in the answers (not as pp). (iii) If answers are not rounded off to 1 decimal place, deduct at most one mark from the marks scored in the answers (not as pp).		segment area $= 31.8238\ cm^2$
(a) (3 marks)		
$\tan \angle CPE = \frac{10}{20}$ or $\tan \angle BPC = \frac{20}{10}$	1M	
$\angle CPE = 26.565°$ or $\angle BPC = 63.435°$		
$\angle CPD = 2\angle CPE$ or $\angle CPD = 180° - 2\angle BPC$	1M	
$\approx 53.1°$ $\approx 53.1°$	1A	Accept 53.0° to 53.2° (1 dec. place)
ALTERNATIVELY,		
$CP = \sqrt{20^2 + 10^2} = \sqrt{500}$		
$\cos \angle CPD = \frac{CP^2 + DP^2 - CD^2}{2(CP)(DP)}$	1M	
$= \frac{500 + 500 - 400}{2\sqrt{500}.\sqrt{500}}$	1M	
$\angle CPD \approx 53.1°$	1A	Accept 53.0° to 53.2°
(b) (3 marks)		
$CP = \sqrt{20^2 + 10^2}$ or $CP = \frac{20}{\sin \angle BPC}$	1M	
$\overset{\frown}{CQD} = \frac{53.13}{360} \times 2\pi\sqrt{20^2 + 10^2}$ or $\sqrt{20^2 + 10^2}\,(0.9273)$	1M	for arc length = rθ and sub
≈ 20.7 (cm)	1A	Accept 20.7 to 20.8
(c) (3 marks)		
Area of sector		
$= \pi(20^2+10^2) \times \frac{53.13}{360}$ or $\frac{1}{2}(20^2+10^2)(0.9273)$	1M	or $\frac{1}{2}(CP)(\overset{\frown}{CQD})$
Area of APBCQD		
$= \pi(20^2 + 10^2) \times \frac{53.13}{360} + 2 \times \frac{1}{2} \times 20 \times 10$	1M	
$= 231.8238 + 200$ $\approx 431.8\ (cm^2)$	1A	Accept 431.2 to 432.1
(d) (3 marks)		
Area of curved surface		
$= \overset{\frown}{CQD} \times 20$	1M	作半圓計 2M
Total surface area		
$= 431.82 \times 2 + 20 \times 20 \times 3 + 20.735 \times 20$	1M	for 6 faces
$\approx 2478.3\ (cm^2)$	1A	Accept 2476.1 to 2480.0

SOLUTION STEPS	MARKS	NOTES
3. (i) For answers without units, do not deduct marks. (ii) For answers with wrong units, deduct at most one mark from the marks scored in the answers (not as pp). (iii) If answers are not rounded off to 2 decimal place, deduct at most one mark from the marks scored in the answers (not as pp).		
(a) (6 marks)		
(i) $\tan 15° = \frac{HA}{AC}$	2A	但在得 HA=5.36 又給 1A.
$HA = 20 \tan 15°$ ≈ 5.36 (m)	1A	
(ii) $\tan 30° = \frac{HA}{AB}$	1M	
$AB = \frac{HA}{\tan 30°}$	1M	
≈ 9.28 (m)	1A	Accept 9.27 to 9.29 9.269 no mark.
(b) (6 marks)		
(i) $\angle ABC = 90°$	1	或寫在圖上的.
$BC^2 = AC^2 - AB^2$	1M	
$= 20^2 - (9.282)^2$	1M	
$BC \approx 17.72$ (m)	1A	Accept 17.71 to 17.73
ALTERNATIVELY,		
$\angle ABC = 90°$	1	may be omitted.
$\sin C = \frac{AB}{AC}$	1M	
$\cos C = \frac{BC}{AC}$	1M	
$BC \approx 17.72$ (m)	1A	
(ii) $\triangle ABC$		
$= \frac{1}{2}(AB) \cdot (BC)$	1M	
$\approx 82.22\ (m^2)$	1A	Accept 82.00 to 82.40

SOLUTION STEPS	MARKS	NOTES
(Syl A only)		
(a) (7 marks)		
(i) $x^3 + x^2 + x - 4 = 0$		
$x^3 + x^2 = -x + 4$		
$y = -x + 4$ ——	1A	This may be omitted.
Graph of $y = -x + 4$ ——	1A	Labelling may be omitted.
$x = 1.1$ or 1.2 ——	1A	
(ii) Testing sign of $x^3 + x^2 + x - 4$ for values of x to 2 decimal places . ——	1M	
x: 1.11, 1.12, 1.13, 1.14, 1.15, 1.16, 1.151 to 1.155 — $x^3 + x^2 + x - 4$: +, +, +, +, +, −, + ——	1A	
	1M	For change of sign
$x = 1.15$ ——	1A	
ALTERNATIVELY, Graphical Method.		
First graph (magnified) ——	1M	
Point of intersection lies between 1.15 and 1.16 ——	1A	
Second graph (magnified). ——	1M	
$x = 1.15$ ——	1A	
(b) (5 marks)		
(i) $2500(1 + r\%)^3 + 2500(1 + r\%)^2 + 2500(1+r\%) = 10\,000$	2A	or equivalent form
$(1 + r\%)^3 + (1+ r\%)^2 + (1 + r\%) = 4$ ——	1	
(ii) put $x = 1 + r\%$ ——	1M	This may be omitted.
$1.15 = 1 + r\%$		
$r = 15$ ——	1A	Accept r = 15%

SOLUTION STEPS	MARKS	NOTES
14. (Syl B only)		
(a) (2 marks)		
$\$7500 \times \frac{4}{3}$ or $\$7500 + \$7500 \times \frac{1}{3}$ ——	1A	
$= \$10\,000$ ——	1A	For answer with no units, withhold this mark.
(b) (5 marks)		
$E = C + kN$ ——	1M	
$10\,000 = C + 300k$ ——	1A	
$16\,000 = C + 500k$ ——	1A	
$200k = 6\,000$ ——	1M	Attempt to solve for k or C
$k = 30$		
$C = 1000$ ——	1A	
(c) (2 marks)		
$E = 1000 + 30N$ ——	2A	
(d) (3 marks)		
$E = 4750 \times 4$ ——	1A	
$= 19\,000$		
$19\,000 = 1000 + 30N$ ——	1M	For substitution
$N = 600$ ——	1A	