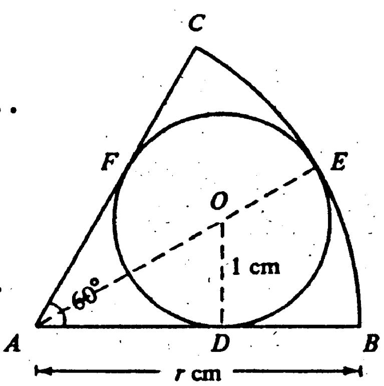
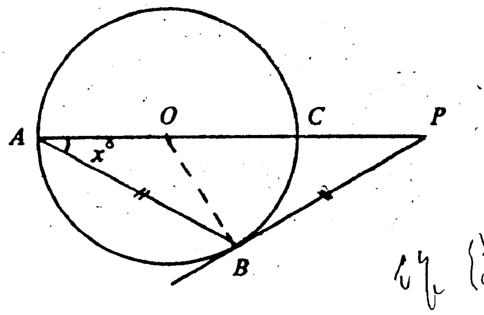
SOLUTION	MARKS	REMARKS
1. (a) $x^2 - 2x + 1 = (x-1)^2$	2A	or $(x-1)(x-1)$
(b) $x^2 - 2x + 1 - 4y^2 = (x-1)^2 - 4y^2$	1M	for $(\quad)^2 - 4y^2$
$= (x - 1 - 2y)(x - 1 + 2y)$	1M+1A	1M for diff. of 2 sq's. No marks for $x^2-4y^2=(x-2y)(x+2y)$
$= (x - 2y - 1)(x + 2y - 1)$		
例 $(x-1-4y)(x-1+4y)$ 得 1M	5	
2. Let $f(x) = 2x^3 + ax^2 + bx - 2$		
Putting $x = 2$,		
$f(2) = 4a + 2b + 14$ 不適当代入 1p-1	1A	
As $x - 2$ divides $f(x)$, $4a + 2b + 14 = 0$.	1M	for $f(2) = 0$ or $f(-1) = 0$
Similarly		
$f(-1) = a - b - 4$	1A	
$= 0$		
Solving the equations, $6a + 6 = 0$		
$a = -1$, $b = -5$	1A+1A	
	5	
(Syll A)		
3. (a) $\sqrt{\dfrac{3^{5k+2}}{27^k}} = \sqrt{\dfrac{3^{5k+2}}{(3^3)^k}}$	1A	
$= 3^{k+1}$	1A	
		or
(b) $\dfrac{\log a^3b^2 - \log ab^2}{\log\sqrt{a}} = \dfrac{\log\dfrac{a^3b^2}{ab^2}}{\log\sqrt{a}}$	1A	$= \dfrac{\log a^3 + \log b^2 - \log a - \log b^2}{\log\sqrt{a}}$ 1A
$= \dfrac{\log a^2}{\log\sqrt{a}}$		$= \dfrac{3\log a - \log a}{\frac{1}{2}\log a}$ 1A
$= \dfrac{2\log a}{\frac{1}{2}\log a}$	1A	
$= 4$	1A	
	5	
(Syll B)		
3. $3^{2x} + 3^x - 2 = 0$		
$(3^x)^2 + 3^x - 2 = 0$	1M	$(3^x)^2$
$(3^x - 1)(3^x + 2) = 0$	1A	
$3^x = 1$ or $3^x = -2$	1A	)
(Rejecting $3^x = -2$)	1A	) Accept $3^x = 1$)
$x = 0$	1A	
	5	

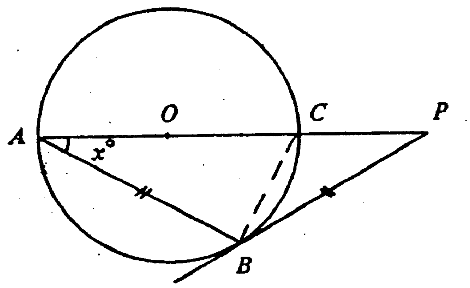
SOLUTION	MARKS	REMARKS
4. $\sin^2\theta = \frac{3}{2}\cos\theta$		
$1 - \cos^2\theta = \frac{3}{2}\cos\theta$	1A	
$2\cos^2\theta + 3\cos\theta - 2 = 0$		
$(2\cos\theta - 1)(\cos\theta + 2) = 0$	1A	
$2\cos\theta = 1$ or $\cos\theta = -2$	1A	) Accept $2\cos\theta = 1$)
Rejecting $\cos\theta = -2$, we have	1A	
$\cos\theta = \frac{1}{2}$		
$\theta = 60°$ or $300°$ (or $\frac{\pi}{3}$, $\frac{5\pi}{3}$)	1A+1A	−1 for each extraneous solution
	6	
5. $kx^2 - 4x + 2k = 0$ $\alpha^2+\beta^2 = (-\frac{4}{k})^2 - 2(2)$ $= \frac{16-4k^2}{k}$		
(4) $\alpha + \beta = \frac{4}{k}$) $\alpha\beta = 2$)	1A	
(a) $\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta$ (b) $\frac{\alpha}{\beta}+\frac{\beta}{\alpha}$	1A	
$= (\frac{4}{k})^2 - (2)(2)$ $= \frac{8-2k^2}{k^2}$ ×	1M	
$= \frac{16}{k^2} - 4$	1A	or $\frac{16-4k^2}{k^2}$ or equivalent.
(b) $\frac{\alpha}{\beta} + \frac{\beta}{\alpha} = \frac{\alpha^2 + \beta^2}{\alpha\beta}$ $\frac{\alpha}{\beta}+\frac{\beta}{\alpha} = \frac{\alpha+\beta}{\alpha\beta} = \frac{\frac{4}{k}}{2}$ $= \frac{2}{k}$	1M	
$= \left(\frac{16}{k^2} - 4\right)\cdot\frac{1}{2}$	1M	
$= \frac{8}{k^2} - 2$	1A	
	6	
6. By symmetry, $\angle BAE = 30°$	1A	
AS $OD \perp AB$,		
$\sin 30° = \frac{1}{AO}$	1A	
$\therefore AO = 2$	1A	
$AE = AO + OE$		
$= 2 + 1$	1M	
$= 3$	1A	
$AB = AE$		
$\therefore r = 3$	1A	
	6	



SOLUTION	MARKS	REMARKS

7.



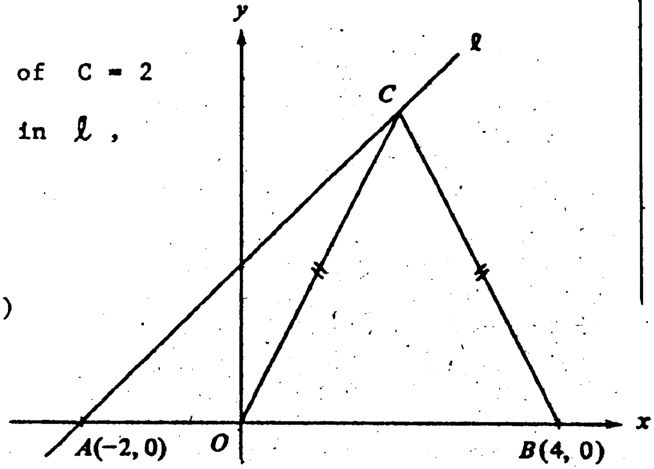


作綫 1分

SOLUTION	MARKS	REMARKS
		Alternatively:
Join OB.	1A	Join BC.
As OA and OB are radii of the same circle, $\angle OBA = \angle PAB = x^\circ$	1A	As PB is a tangent, $\angle CBP = \angle PAB = x^\circ$.
Since PB is a tangent, $\angle OBP = 90^\circ$	1A	Since AC is a diameter, $\angle ABC = 90^\circ$ etc.
Given that BA = BP $\angle BPA = \angle PAB = x^\circ$	1A	
$x + x + x + 90 = 180$	1A	
$3x = 90$ $x = 30$	1A 6	

過程祇有三x，若只有二x，祇不正確

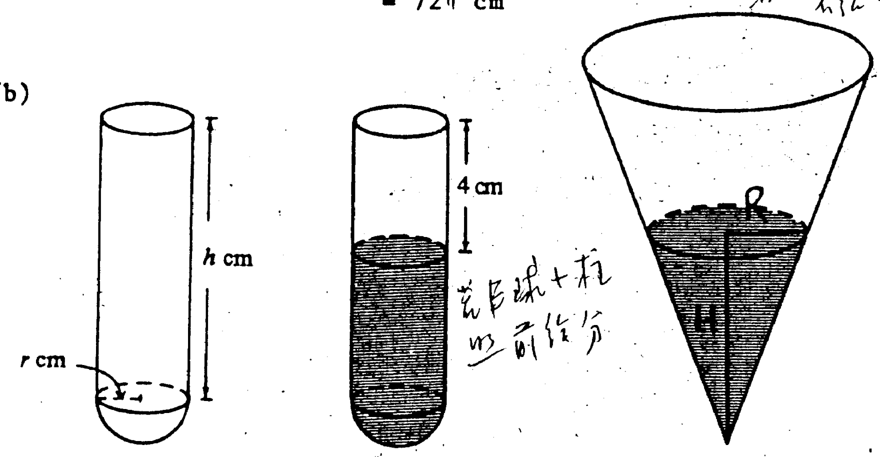
只有 $3x = 90$, $x = 30$ 得2分

SOLUTION	MARKS	REMARKS
8. (a) Equation of ℓ is $y - 0 = (1)[x - (-2)]$	1A	
(2) i.e. $y = x + 2$ (or $x - y + 2 = 0$)	1A	
	2	
(b) As $CO = CB$, C lies on the perpendicular bisector of OB.	1M	**Alternatively:**
(3)		Let $C = (x, y)$
直接寫出 C(2,) 1分		$\sqrt{x^2+y^2} = \sqrt{(x-4)^2+y^2}$ 1M
x-coordinate of $C = 2$	1A	$8x = 16$
Substituting in ℓ,		$x = 2$ 1A
$y = 2 + 2$		
$= 4$	1A	
$\therefore C = (2, 4)$		
	3	
(c) Let the equation of the circle be		**Alternatively:**
(4) $x^2 + y^2 + ax + by + c = 0$.	方程加1分	The centre of the circle lies on the perpendicular bisector of OB (or OC, BC) 1M
Substituting $(x, y) = (0, 0)$ or $(4, 0)$ or $(2, 4)$,	1M	
$c = 0$	1A	Let it be $(2, y)$
$16 + 4a = 0$		$(2-0)^2 + (y-0)^2$
$4 + 16 + 2a + 4b = 0$		$= (2-2)^2 + (y-4)^2$
Method $(x-h)^2+(y-k)^2=r^2$ 設1式 — 1M. centre 1A+1A radius 1A eg. +A		$y = 3/2$
		The centre is $(2, \frac{3}{2})$ 1A
$a = -4$	1A	Radius of circle
$b = -3$	1A	$= \sqrt{4 + \frac{9}{4}} = \frac{5}{2}$ 1A
$\therefore$ the equation of the circle is		$\therefore$ eqn. of circle is
$x^2 + y^2 - 4x - 3y = 0$.		$(x-2)^2+(y-\frac{3}{2})^2 = \frac{25}{4}$ 1A
		or
		$x^2+y^2-4x-3y = 0$
	4	
(d) Substituting $y = x + 2$ in the equation of the circle,		
(3) $x^2 + (x + 2)^2 - 4x - 3(x + 2) = 0$	1M	
$2x^2 - 3x - 2 = 0$		
$(2x + 1)(x - 2) = 0$		
$x = 2$ or $-\frac{1}{2}$ 若只寫 $-\frac{1}{2}$ 仍給分	1A	
Putting $x = -\frac{1}{2}$, $y = \frac{3}{2}$	1A	
若得出2點坐標 不給此1A		
$\therefore D = (-\frac{1}{2}, \frac{3}{2})$		
	3	

RESTRICTED 内部文件

SOLUTION	MARKS	REMARKS
9. (a) (i) Capacity of hemispherical part		
$= (\frac{1}{2})(\frac{4}{3})\pi r^3$ 若能写出有 r^3之方程 则可得1M.		
(3)+(3) $= (\frac{1}{6})(108\pi)$	1M+1A	1M for setting up eqn in r^3. 1A for correct eqn.
$r^3 = 27$		
$r = 3$	1A	
Capacity of cylindrical part		若写 $r = ..$ cm 亦作是
$= \pi r^2 h$		
$= 9\pi h$ .... 若r有错，仍给此1M	1M	
$9\pi h = (\frac{5}{6})(108\pi)$	1A	
$h = 10$	1A	
(ii) Volume of space $= \pi(3^2)(4)$ 108π − 1M		**Alternatively:**
(3) Volume of water $= 108\pi - (\pi)(3^2)(4)$ 若r有错 1M	1M+1M	Volume $= \pi(3)^2(10-4)+\frac{108\pi}{6}$ ... 1M+1M
$= 72\pi\ cm^3$ 若不以π表示 不给	1A	$= 72\pi\ cm^3$ 1A
	9	

(b) (3)

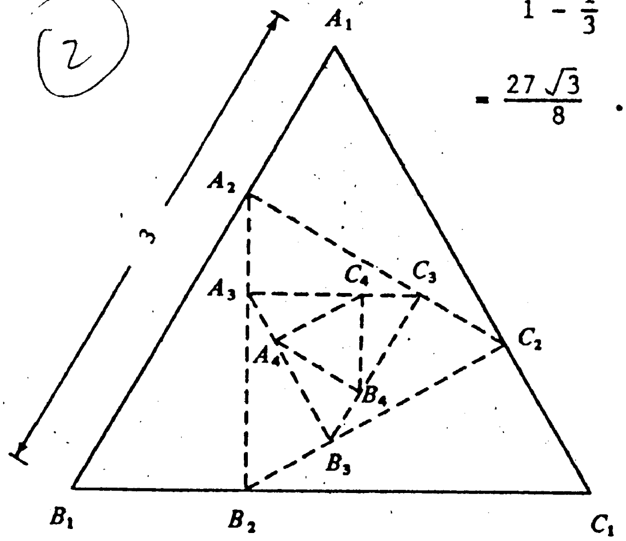


若只球+柱 此前给分

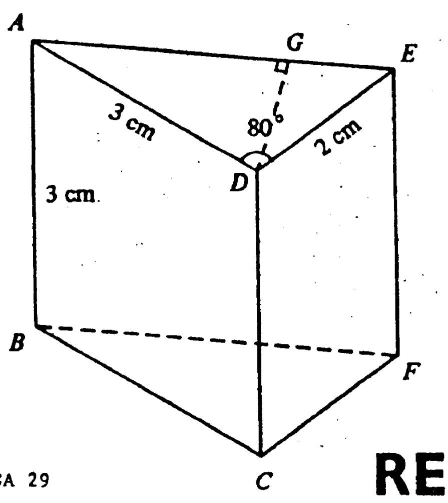
SOLUTION	MARKS	REMARKS
Let radius and depth of water be R and H .		
$\frac{1}{3}\pi R^2 H = 72\pi$ 若上有错 给此1M分	1M	
$R^2 H = 216$		
Capacity of vessel $= \frac{1}{3}\pi(2R)^2(2H)$	1M	
$= \frac{8}{3}\pi R^2 H$		
$= \frac{8}{3}\pi\cdot(216)$		可不给此分
$= 576\pi\ cm^3$	1A	−1 if unit not given
	3	

SOLUTION	MARKS	REMARKS
Alternatively:		
Since height of vessel = 2 X height of water		
Capacity of vessel $= 2^3 \times 72\pi$	2M	
$= 576\pi\ cm^3$	1A	−1 if unit not given
	3	

SOLUTION	MARKS	REMARKS
10. (a) Since the triangle is equilateral, $\angle A_1 = 60°$,		
(2) $T_1 = \frac{1}{2}(3)(3)(\sin 60°)$	1M	
$= \frac{9\sqrt{3}}{4}$	1A	
	2	
(b) (i) Since $A_2B_1 = 2$, $B_1B_2 = 1$ and $\angle B_1 = 60°$,		**Alternatively:** By cosine rule,
(2) $\angle B_1B_2A_2 = 90°$	1M	$(A_2B_2)^2$
$\therefore A_2B_2 = \sqrt{3}$	1A	$= 2^2+1^2-2(2)(1)\cos 60°$ $= 3$ $\therefore A_2B_2 = \sqrt{3}$
(ii) $\Delta A_2B_2C_2$ and $\Delta A_1B_1C_1$ are similar. The ratio of their sides is $\sqrt{3} : 3$. (2)		
$\therefore T_2 = \frac{9\sqrt{3}}{4}\left(\frac{\sqrt{3}}{3}\right)^2$	1M	
$= \frac{3\sqrt{3}}{4}$ 接受 $\frac{\sqrt{27}}{4}$	1A	
	4	
(c) (i) The common ratio $= \frac{1}{3}$ (1M，若以小數表之不扣分)	1M	
(ii) $T_n = \frac{9\sqrt{3}}{4}\left(\frac{1}{3}\right)^{n-1}$ ↖欠此括號 pp-1	1M	
(4) (iii) $T_1 + T_2 + \dots + T_n = \frac{9\sqrt{3}}{4} \cdot \frac{1-\left(\frac{1}{3}\right)^n}{1-\frac{1}{3}}$	1M	
$= \frac{27\sqrt{3}\left(1-\frac{1}{3^n}\right)}{8}$	1A	
(iv) The sum to infinity $= \frac{\frac{9\sqrt{3}}{4}}{1-\frac{1}{3}}$ 只公式，不給M分	1M	
(2) $= \frac{27\sqrt{3}}{8}$	1A	
	6	



SOLUTION	MARKS	REMARKS
11. (a) Consider Δ ADE . By the cosine rule		
3 $AE^2 = AD^2 + DE^2 - 2AD \cdot DE \cos \angle ADE$ 要逐步表示 △ADE 边	1M	correct use of formula
$= 3^2 + 2^2 - 12\cos 80°$ (= 10.91622)	1A	
$AE = 3.304$ cm (correct to 3 d.p.)	1A	
	3	
(b) Consider Δ ADE again. By the sine rule,		
3 $\dfrac{DE}{\sin \angle DAE} = \dfrac{AE}{\sin \angle ADE}$	2M	or cos rule
使用公式时给(a)		
$\sin \angle DAE = \dfrac{DE \sin A\hat{D}E}{AE}$		
$\left(= \dfrac{1.9696}{3.304} = 0.59613 \right)$		
$\angle DAE = 36.593°$ (correct to 3 d.p.)	1A	Accept 36.593-36.594
以分数表示，不给此1A分	3	
(c) $DG = AD \sin D\hat{A}E$	1M	or $\sin D\hat{A}E = \dfrac{DG}{AD}$
2 (= $3\sin 36.593°$) 不须以 cm 表示		
(= (3)(0.59613))		
= 1.788 cm (correct to 3 d.p.)	1A	
	2	
(d) $BD^2 = AB^2 + AD^2$	1M	
2 $BD = \sqrt{18}$		
= 4.243 cm (correct to 3 d.p.)	1A	
	2	
(e) $\sin D\hat{B}G = \dfrac{DG}{BD}$	1M	
2 $\left(= \dfrac{1.788}{4.243} = 0.4214 \right)$		
$\therefore \angle DBG = 24.923°$ (correct to 3 d.p.)	1A	Accept 24.920-24.940
	2	



SOLUTION	MARKS	REMARKS
12. (a) Given that $x \geqslant 0$		
$y \geqslant 0$		
$4000x + 6000y \geqslant 24\ 000$		
Considering Products B and C ,		
(2) $\underline{20\ 000x + 5000y \geqslant 60\ 000}$	1A	Withhold 1A if '=' missing
$\underline{6000x + 3000y \geqslant 24\ 000}$	1A	
	2	
(b) The constraints in (a) can be written as		
(6) $x \geqslant 0$ $y \geqslant 0$ $2x + 3y \geqslant 12$ $4x + y \geqslant 12$ $2x + y \geqslant 8$		
直线都给分 用虚线，不接受 但不包括 region		
The lines corresponding to the last 3 inequalities are shown on the graph paper.	1A+1A +1A	±1 unit at x,y axes
Shading the correct region. 不画出的 shading 可扣 (PP-1)	3A	-1 if shading not complete. -2 if only arrows used
	6	
(c) Cost of materials used = $4000x + 3000y$ (dollars)	1A	
Drawing the line $4000x + 3000y = 0$ (or equivalent) ~~(要求 slope 要正确~~) 不需要太准确)	1M	Candidates may also test all vertices of given region.
The cost is least when $x = 3,\ y = 2$ 可不写出	1A	Awarded only if region correct
and the least cost is 18 000 (dollars)	1A	
	4	

Point	Cost
(6,0)	24 000
(3,2)	18 000
(2,4)	20 000
(0,12)	36 000

要全代入

不 test 但只述 by testing 不给 1M 分

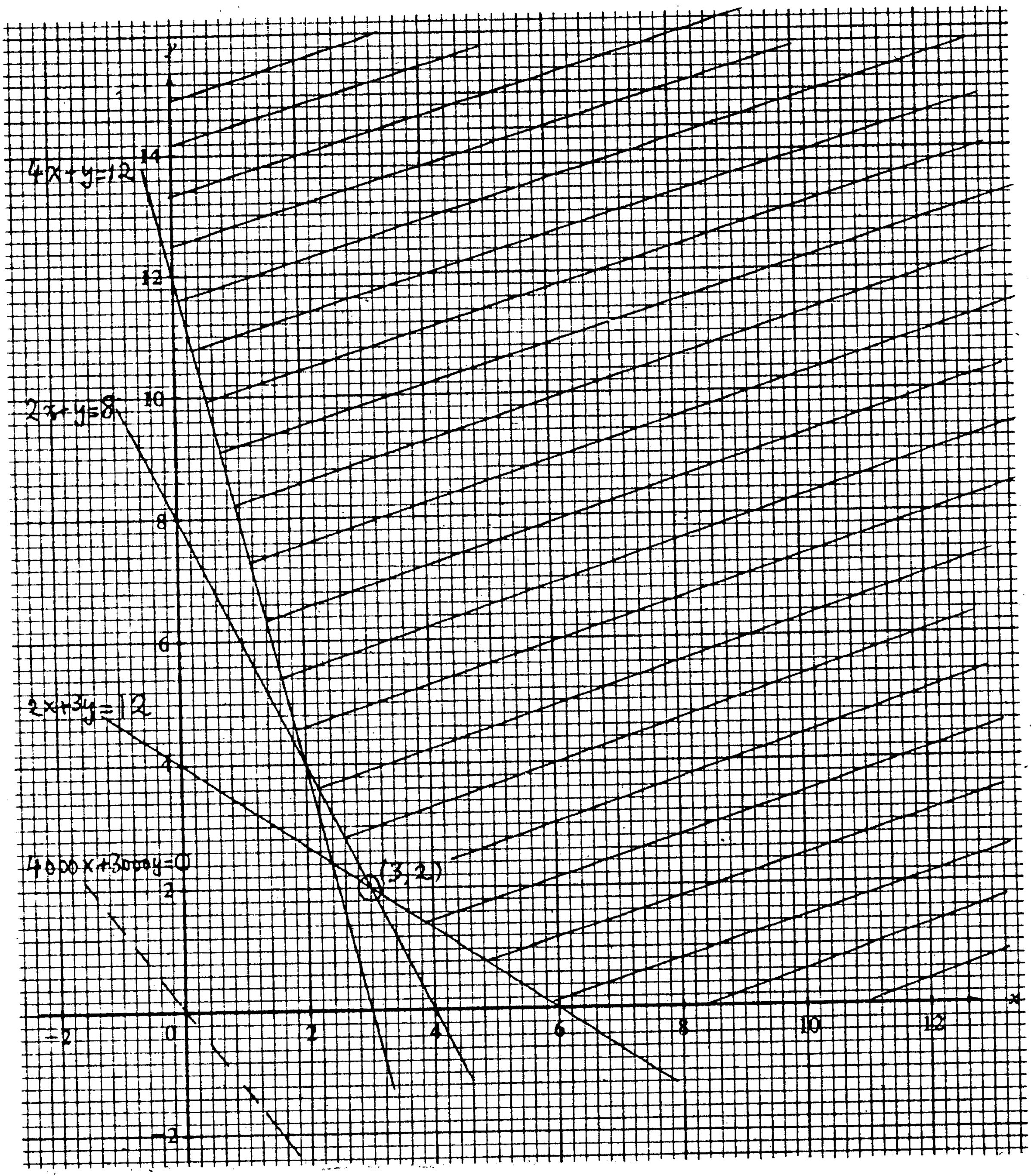
或 Test 后不表出，也不给 1M.

若 shading 相反部份 (指明) 扣 (PP-1)

只写值，不扣分

而得 1A 亦必须 (checking 会显全对)

12.


y
x
4x+y=12
2x+y=8
2x+3y=12
4000x+3000y=0
(3,2)
14
12
10
8
6
4
2
-2
-2
0
2
4
6
8
10
12

SOLUTION	MARKS	REMARKS
13. (a) The probability that the black ball is not drawn $= \frac{5}{6}$ (or $1 - \frac{1}{6} = \frac{5}{6}$)	2A	Any value roundable to 0.83 P.P. if only answer is given. However, accept P = 5/6.
2	2	
(b) The probability that the black ball is drawn from P to Q in the 1st draw $= \frac{1}{6}$	1A	
4 After that, the probability that the black ball is not drawn from Q to R in the 2nd draw $= \frac{4}{5}$	1A	
∴ the probability that the black ball is in Q		
$= \frac{1}{6} \times \frac{4}{5}$ $\frac{1}{6} + \frac{4}{5}$ 1+1		
$= \frac{2}{15}$ $\left(= \frac{4}{30} \right)$ $\frac{1}{6} \times \frac{4}{5} \times$ — 1+1	2A	
	4	Alternatively: $1 - \frac{5}{6} - \frac{2}{15}$ 1M 2M
(c) The probability that the black ball is drawn from Q to R $= \frac{1}{5}$	1A	
3 ∴ the probability that the black ball is in R		
$= \frac{1}{6} \times \frac{1}{5}$	1A	
$= \frac{1}{30}$ $= 0.03$ $\frac{1}{6}$ 1A $\frac{1}{5}$ 1A	1A	
	3	
(d) The probability that a white ball is drawn from P to Q in the 1st draw $= \frac{3}{6}$ $\left(= \frac{1}{2} \right)$	1A	若不表示所求概率者則 PP-1
3 After that, the probability that a white ball is drawn from Q to R in the 2nd draw $= \frac{1}{5}$	1A	
∴ the proabability that all balls in R are white $= \frac{1}{2} \times \frac{1}{5}$ 1+1 $1 - \left(\frac{3}{6} \times \frac{5}{5} + \frac{3}{6} \times \frac{4}{5} \right)$		
$= \frac{1}{10}$	1A	若解法達到中 而有正確答案 給全部分數
0.1 容許 $\frac{3}{30}$	3	

SOLUTION	MARKS	REMARKS
(Syllabus A)		
14. (a) (i) $x^3 - 6x^2 + 9x - 1 = 0$		
③ $x^3 - 6x^2 + 9x = 1$	1M	
Drawing the line $y = 1$, the roots of the given equation were found to be 0.1, 2.3 and 3.5 (correct to 1 d.p.).	1A+1A	1 mark for 2 correct answers
首二答案 1分 / 第三 .. 1分 / 不答一位小數 不給分		
(ii) $x^3 - 6x^2 + 10x - 6 = 0$		
③ $x^3 - 6x^2 + 9x = 6 - x$	1M	for correct L.S.
Drawing the line $y = 6 - x$, the root was found to be 3.8 (correct to 1 d.p.)	1A 1A	for graph, ± 1 unit at (3,3), (4,2)
答案 若作3.7 不給 1A	6	

(b) ③

x	$x^3 - 6x^2 + 10x - 6$
3.76	$-$ ($= -0.068$)
3.77	$+$ ($= 0.005$)
3.765	$-$ ($= -0.031$)

— change signs 給 1M.

3.76, 3.77 .... — 1M — Change of sign, $-$ve for 3.765–3.769

3.77, 3.765 ... — 1A — May use graphical method

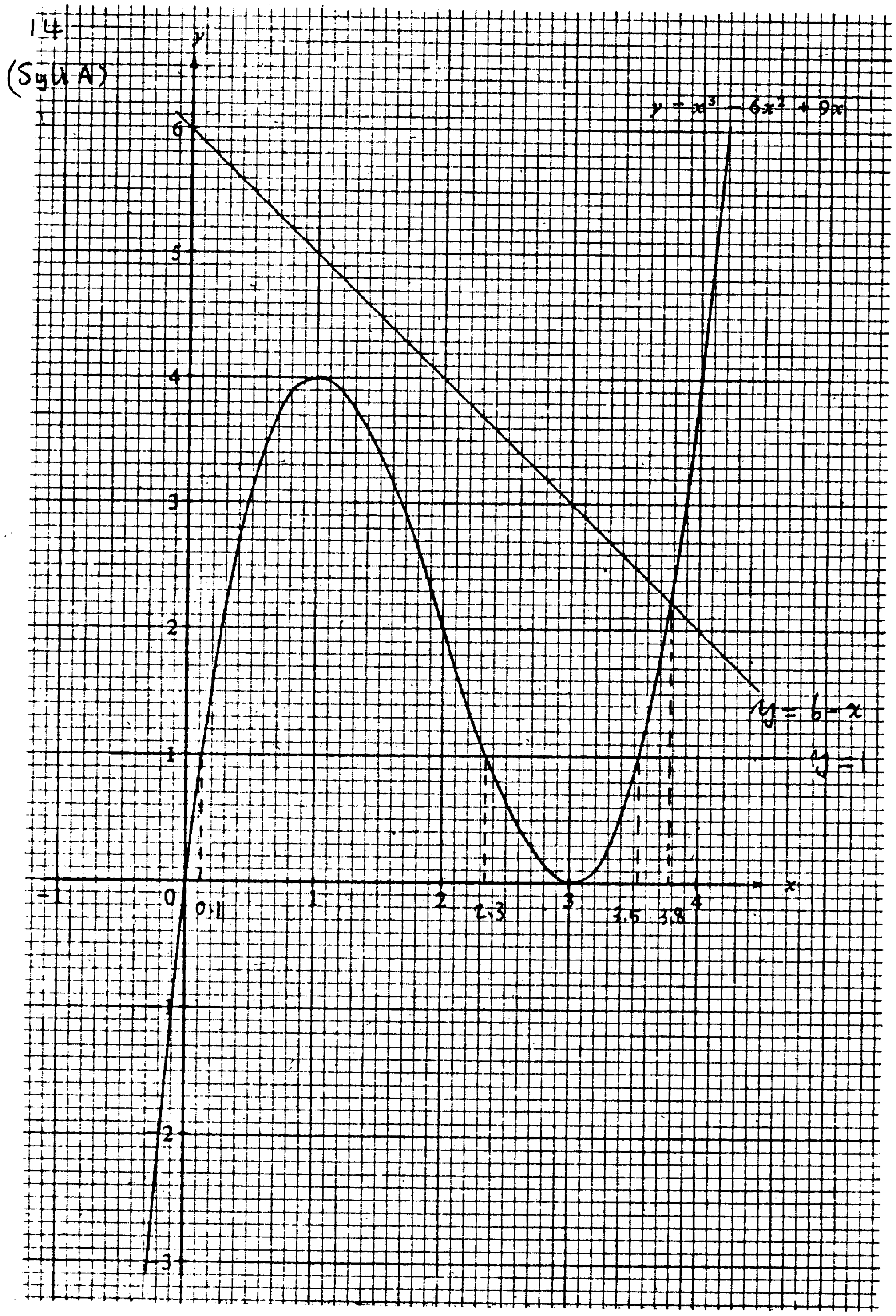
3.768 – 3.769 之範圍

$\therefore x = 3.77$ (correct to 2 d.p.) — 1A

Total: 3

SOLUTION	MARKS	REMARKS
(c) Consider $x^3 - 6x^2 + 9x = k$ ← 可不寫	1M	
From the graph, if $0 < k < 4$,	1A+1A	-1 for '$\leq$' if otherwise correct.
the line $y = k$ meets the curve $y = x^3 - 6x^2 + 9x$ at three distinct points.		may omit
$\therefore x^3 - 6x^2 + 9x - k = 0$ has three distinct roots.	3	

14
(Syll A)



SOLUTION	MARKS	REMARKS
(Syllabus B)		
14. (a) Since $y \propto x$ and $z \propto \frac{1}{x}$, $y = k_1 x$ and $z = \frac{k_2}{x}$	1A+1A	Accept $y = kx$, $z = \frac{k}{x}$
(for some real k_1, k_2).		
$\therefore\ p = k_1 x + \frac{k_2}{x}$		
Putting $x = 2$, $p = 7$, (or $x = 3$, $p = 8$)	1M	
$7 = 2k_1 + \frac{k_2}{2}$	1A	
i.e. $4k_1 + k_2 = 14$		
Putting $x = 3$, $p = 8$.		
$8 = 3k_1 + \frac{k_2}{3}$	1A	
or $9k_1 + k_2 = 24$		
Solving these two equations,		
$5k_1 = 10$		
$k_1 = 2$	1A	
$k_2 = 6$	1A	
$\therefore\ p = 2x + \frac{6}{x}$		
When $x = 4$, $p = 2(4) + \frac{6}{4}$		
$= \frac{19}{2}$	1A	
	8	
(b) $2x + \frac{6}{x} < 13$	1M	
$2x^2 - 13x + 6 < 0$ (as $x > 0$)	1A	
$(2x - 1)(x - 6) < 0$		
$\therefore\ \frac{1}{2} < x < 6$	2A	-1 for '$\leq$'
	4	