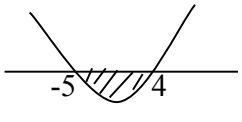
SPM TRIAL EXAM 2012
Marking Scheme
Additional mathematics Paper I

Number	Solution and marking scheme	Sub Marks	Full Marks
1	(a) {p, r, s} (b) {a , b, c, d} (c) Many to One	1 1 1	3
2	(a) $\frac{7}{2}$ B1: $2x-5=2$ atau $f(x)=\frac{x+5}{2}$	2	2
3	(a) 5 (b) $2x+4$ B2: $-3f(x)+5=-6x-7$ B1 : $-3f(x)+5$	1 3	4
4	$p=-7$, $q=-10$ (both) B2: $p=-7$ or $q=-10$ B1: $\frac{7}{3}=\frac{-p}{3}$ or $\frac{-10}{3}=\frac{q}{3}$ or $3x^2-7x-10=0$ or $3(-1)^2+p(1)+q=0$, $3(10/3)^2+p(10/3)+q=0$	3	3
5	$h=2$ and $k=3$ B2 : $h=2$ atau $k=3$ B1 : $\frac{h}{3}=1$ or $h^2+2+k=9$	3	3
6	$-5\le x\le 4$ B2: $(x-4)(x+5)\le 0$ or  B1 : $x^2+x-20\le 0$	3	3

7	$\frac{2}{r}+\frac{1}{p}$ or $\frac{2p+r}{pr}$ B3: $\frac{\log_2 2}{\log_2 m}+2\frac{\log_3 3}{\log_3 m}$ B2: $\log_m 2 + 2\log_m 3$ or $\frac{\log_2 2}{\log_2 m}+\frac{\log_3 3^2}{\log_3 m}$ B1 : $\log 2 + \log 3^2$ or $2\log_m 3$ or $\frac{\log 2}{\log m}$ or $\frac{\log 3}{\log m}$	4	4
8	$x = 8p + 15$ B2: $x - 3 = 4(2p + 3)$ B1: 2^3 or $2^{4(2p+3)}$	3	3
9	a) 3 b) 360 B1: $\frac{18}{2}[2(3)+(18-1)2]$	1 2	3
10	$a = -13$, $d = 4$ (both) B2: $a = -13$ or $d = 4$ B1: $a + 2d = -5$ or $a + 7d = 15$	3	3
11	(a) $r = x^2$ (b) $\frac{1}{3}$ B1: $\frac{1}{8}=\frac{x^2}{1-x^2}$	1 2	3
12	a) $\frac{y}{x} = px^2 + q$ b) $p = -2$, $q = 8$ B2 : $p = -2$ or $q = 8$ B1: $p=\frac{4-0}{2-4}$ or $0 = (-2)(4) + q$ or $4 = p(2) + q$	1 3	4

13	2,12 B2: $\left(\frac{3-7}{h-4}\right)\times\left(\frac{3-(-1)}{h-10}\right)=-1$ or form equation using Pythagoras theorem B1: $\frac{3-7}{h-4}$ or $\frac{3-(-1)}{h-10}$ of find the lengths of AB, BC and AC using distance formula	3	3
14	(a) $\frac{1}{w}$ (b) $2w\sqrt{1-w^2}$ B1: $\sqrt{1-w^2}$ or $2w\cos\theta$	1 2	3
15	26.57 ° ,116.57 ° , 206.57 ° , 296.57 ° B3: 26.57 ° and 116.57 ° B2: $(2\tan x-1)(\tan x+2)$ B1: $2\tan^2 x+3\tan x-2=0$	4	4
16	(a) 13 (b) k = −13 B1: $\begin{pmatrix}12+k+1\\-5+2\end{pmatrix}$ or $(12+k+1)\underline{i}+(-5+2)\underline{j}$	1 2	3
17	(a) $4\underline{a}+4\underline{b}$ (b) $-2\underline{a}+4\underline{b}$ B1: $-6\underline{a}+(4\underline{a}+4\underline{b})$	1 2	3
18	8 B2: $1.3r+r+r+1.3(r-3)+(r-3)+(r-3)=42.9$ B1: $1.3r$ or $1.3(r-3)$	3	3
19	$\frac{12}{5}$ B2: $2\left(\frac{3(2)}{2^2+1}-0\right)$ B1: $2\left[\frac{3x}{x^2+1}\right]_0^2$	3	3

20	$a^2 + a - 12$ B2: $\left[(a^2 + a) - ((-4)^2 + (-4))\right]$ B1: $\left[x^2 + x\right]$	3	3
21	$k = 8$ B3: $(k+1)(k-8) = 0$ B2: $\frac{2^2 + 5^2 + k^2}{3} - \left(\frac{2 + 5 + k}{3}\right)^2 = 6$ B1: $\bar{x} = \frac{2 + 5 + k}{3}$ or $\sum x^2 = 2^2 + 5^2 + k^2$	4	4
22	$(\frac{1}{3}, -\frac{2}{3})$ B2 : $x = \frac{1}{3}$, $y = 2(⅓)(3\times⅓-2)$ B1 : $12x - 4 = 0$	3	3
23	(a) 1 (b) i) 5040 ii) 288 B1: $2 \times 3! \times 4!$	1 1 2	4
24	(a) $\frac{4}{15}$ (b) $\frac{3}{5}$ B1 : $1 - \left(\frac{3}{5}\right)\left(\frac{2}{3}\right)$ or $\frac{2}{5}\times\frac{1}{3} + \frac{3}{5}\times\frac{1}{3} + \frac{2}{5}\times\frac{2}{3}$	1 2	3
25	(a) $\frac{3}{5}$ (b) $\frac{144}{625}$ B1: ${}^5C_2\left(\frac{3}{5}\right)^2\left(\frac{2}{5}\right)^3$	1 2	3

SPM TRIAL EXAM 2012
Marking Scheme
Additional Mathematics Paper 2

SECTION A

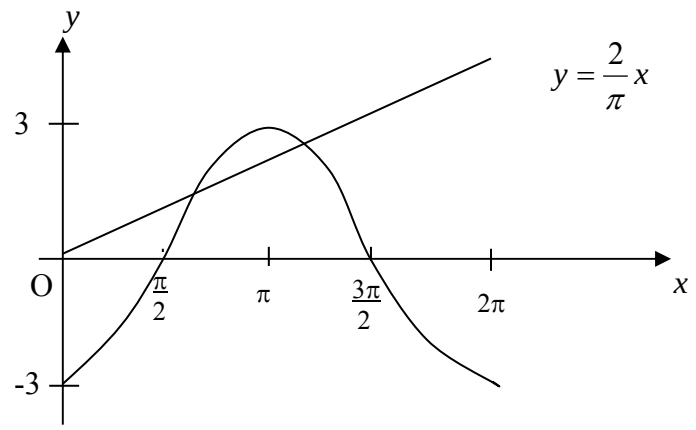
Question	Important Steps	Marks
1	$y = 3x - 4$	1
	$5x^2 - 4x(3x-4) + (3x-4)^2 = 9$ or $2x^2 - 8x + 7 = 0$	1
	$x = \dfrac{-(-8) \pm \sqrt{(-8)^2 - 4(2)(7)}}{2(2)}$	1
	$x = 2.707, 1.293$	1
	$y = 3(2.707) - 4$, $y = 3(1.293) - 4$ $= 4.121$ $= -0.121$	1
	TOTAL	5

2 (*a*)	Change base of logarithm : $\log_4 (1-2x) = \dfrac{\log_2 (1-2x)}{\log_2 4}$ *or equivalent*	1
	Use $n \log x = \log x^n$: $2 \log_2 (1-2x) = \log_2 (1-2x)^2$	1
	Solve : $(2x+5) = (1-2x)^2$	1
	$x = -\frac{1}{2}, 2$	1
	$x = -\frac{1}{2}$	1
(*b*)	$\frac{1}{3}$	1
	TOTAL	6

3 (*a*)	-8	1
(*b*)	Use $T_n = a + (n-1)d$: $-8 + (22-1)(3)$	1
	Use $S_n = \frac{n}{2}[2a + (n-1)d]$: $\frac{n}{2}[2(-8) + (n-1)(3)]$	1
	Solve : $\frac{n}{2}[2(-8) + (n-1)(3)] = 55$	1
	$n = 10$	1
(*c*)	T_{13}	1
	28	1
	TOTAL	7

4 (a)	$x = 3$	1
(b)	$median = 9.5 + \left(\dfrac{10-9}{5}\right)5$	1

	Median = 10.5	1
(c)	All midpoints are correct.	1
	$\bar{x} = \frac{3(2)+6(7)+5(12)+4(17)+2(22)}{20} = \frac{220}{20} = 11$	1
	$\sum fx^2 = 3(2^2)+6(7^2)+5(12^2)+4(17^2)+2(22^2) = 3150$ or $\Sigma f(x-\bar{x})^2 = 730$	1
	$\sigma^2 = \frac{3150}{20} - \left(\frac{220}{20}\right)^2$ or $\sigma^2 = \frac{730}{20}$	1
	$= 36.5$	1
	TOTAL	8

5 (a)		Shape 1 Max/min 1 One period 1 Complete from 0 to 2π 1
(b)	Equation $y = \frac{2}{\pi}x$	1
	Straight line $y = \frac{2}{\pi}x$	1
	2 solutions	1
	TOTAL	7

6 (a)	$m_{QS} = \frac{3}{2}$	1
	$y-1 = \frac{3}{2}(x-6)$	1
	$y = \frac{3}{2}x - 8$	1
(b)	Q(0, −8)	1
	$\sqrt{[(x-6)^2+(y-1)^2]}$ or $\sqrt{[(6-0)^2+(1+8)^2]}$	1
	$x^2 - 12x + 36 + y^2 - 2y + 1 = 117$	1
	$x^2 + y^2 - 12x - 2y - 80 = 0$	1
	TOTAL	7

SECTION B

7 (*a*)	<table><tr><td>x</td><td>1</td><td>1.5</td><td>2</td><td>2.5</td><td>3</td><td>3.5</td><td>4</td></tr><tr><td>$\log_{10} y$</td><td>0.04</td><td>0.18</td><td>0.28</td><td>0.40</td><td>0.52</td><td>0.62</td><td>0.76</td></tr></table>	1
(*b*)	Plot $\log_{10} y$ against x [correct axes and uniform scales]	1
	All 7 points plotted correctly	1
	Line of best fit	1
(*c*) (i)	3.72	1
(ii)	$\log_{10} y = (\frac{\log_{10} k}{2})x - \frac{\log_{10} h}{2}$	1
	Use $c = -\frac{\log_{10} h}{2}$: $-\frac{\log_{10} h}{2} = -0.2$	1
	$h = 2.5$	1
(iii)	Use $m = \frac{\log_{10} k}{2}$: $\frac{\log_{10} k}{2} = 0.24$	1
	$k = 3.0$	1
	TOTAL	10

8 (a)	$y = \int -2x \ dx$	1
	$y = \frac{-2x^2}{2} + c$	1
	$y = -x^2 + 9$	1
(b)	$\int_0^3 (-x^2 + 9) \ dx$	1
	$\left[\frac{-x^3}{3} + 9x\right]_0^3$	1
	$\frac{1}{2}(10)(10) - \int_0^3 (-x^2 + 9) \ dx$ **or** $50 - \int_0^3 (-x^2 + 9) \ dx$ **or** $\frac{1}{2}(10)(10) - \left[\frac{-x^3}{3} + 9x\right]_0^3$ **or** $50 - \left[\frac{-x^3}{3} + 9x\right]_0^3$	1
	$= 32$	1
(c)	Volume $= \pi\int (9 - y) \ dy$	1
	$\pi\left[9y - \frac{y^2}{2}\right]_0^9$	1

	$\frac{81}{2}\pi$ *or* equivalent	1
	TOTAL	10

9 (a)	Angle AOB = 6.5/5	1
	= 1.3 rad.	1
	Angle POQ = 0.8667 rad.	1
(b)	$MN = 5 \times \sin(0.8667 \text{ rad.}) = 3.811$ cm or ON = 5 × cos(0.8667 rad.) = 3.2367 cm	1
	Length of arc $PQ = 6 \times 0.8667 = 5.2002$	1
	Perimeter = 3.811 + 5.2002 + 1 + (6–3.2367)	1
	= 12.77 cm	1
(c)	Area of sector $OPQ = ½ \times 6^2 \times 0.8667$	1
	Area of shaded region = 15.60 – ½ (3.811)(3.2367)	1
	= 9.433	1
	TOTAL	10

10 (a) (i)	$\overrightarrow{PT} = \overrightarrow{PR} + \overrightarrow{RT}$ $\overrightarrow{RT} = \frac{1}{2}(-8\underline{y} + 14\underline{x})$	1
	$\overrightarrow{PT} = 8\underline{y} + \frac{1}{2}(-8\underline{y} + 14\underline{x})$ $= 7\underline{x} + 4\underline{y}$	1
(ii)	$\overrightarrow{RS} = \overrightarrow{RP} + \overrightarrow{PS}$ $= -8\underline{y} + \frac{1}{3}(14\underline{x})$	1
	$= \frac{14}{3}\underline{x} - 8\underline{y}$	1
(b) (i)	$\overrightarrow{PM} = 7h\underline{x} + 4h\underline{y}$	1
(ii)	$\overrightarrow{PM} = \overrightarrow{PR} + \overrightarrow{RM}$ $= 8\underline{y} + k(\frac{14}{3}\underline{x} - 8\underline{y})$	1
	$= \frac{14}{3}k\underline{x} + (8 - 8k)\underline{y}$	1
(c)	$7h = \frac{14}{3}k$ or $8 - 8k = 4h$	1
	$h = \frac{1}{2}$	1
	$k = \frac{3}{4}$	1
	TOTAL	10

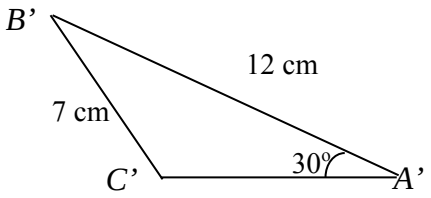
11 (a)(i)	$P(X = 7) = {}^{10}C_7 (0.45)^7 (0.55)^3$	1
	$= 0.07460$	1
(ii)	$P(X = 0, 1, 3)$ $= {}^{10}C_0(0.45)^0(0.55)^{10} + {}^{10}C_1(0.45)^1(0.55)^9 + {}^{10}C_2(0.45)^2(0.55)^8$	1
	$= 0.09956$	1
(b) (i)	$P(\frac{6.0-7.2}{1.2} < z < \frac{8.1-7.2}{1.2})$ OR $P(-1 < z < 0.75)$	1
	$= 1 - 0.1587 - 0.2266$	1
	$= 0.6147$	1
(ii)	$p\left(z > \frac{t-7.2}{1.2}\right) = \frac{48}{60} = 0.8$	1
	$\frac{t-7.2}{1.2} = -0.842$	1
	$t = 6.1896$ *or* 6.190	1
	TOTAL	10

SECTION C

12 (a)	$a = \frac{dv}{dt} = 1.4 - 0.6t$	1
	$= 1.4 - 0.6(2)$ $= 0.2$	1
(b)	$1.4t - 0.3t^2 + 0.5 = 0$	1
	$(3t + 1)(t - 5) = 0$ or using quadratic formula	1
	$t = 5$	1
(c)	$s = \int (1.4t - 0.3t^2 + 0.5)dt = 0.7t^2 - 0.1t^3 + 0.5t + c$ integrate	1
	At $t = 0$, $s = 0 \Rightarrow c = 0$ finding c or $\int_0^5 1.4t - 0.3t^2 + 0.5dt + \left\lvert\int_5^{10} 1.4t - 0.3t^2 + 0.5dt\right\rvert$ limits √	1
	When $t = 5$, $s = 7.5$ m, when $t = 10$, $s = -25$ m or substitute t=0, 5, 10 in $[0.7t^2 - 0.1t^3 + 0.5t]$	1
	Total distance = 7.5 x 2 + 25 or $7.5 + \lvert-25 - 7.5\rvert$	1
	= 40 m	1
	TOTAL	10

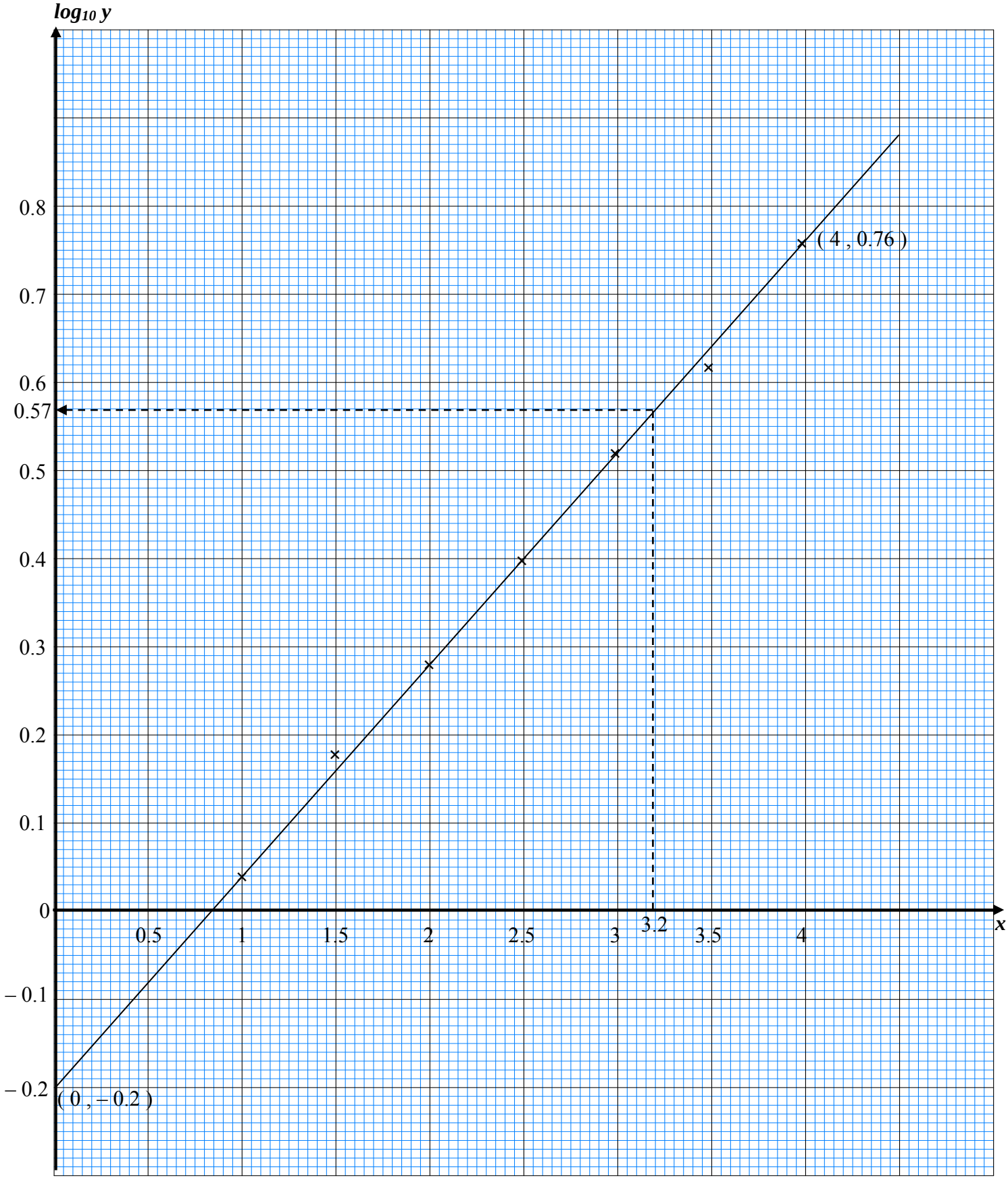
13 (a)	$x = \frac{158}{130} \times 100$	1
	$= 121.54$	1

(b)	$A \Rightarrow \frac{150}{140} \times 100 = 107.14$	1
	$B \Rightarrow \frac{121.54}{135} \times 100 = 90.03$	1
	$C \Rightarrow \frac{120}{110} \times 100 = 109.09$	1
	$D \Rightarrow \frac{123}{120} \times 100 = 102.5$	1
(c)	$I = \frac{(107.14 \times 3) + (90.03 \times 5) + (109.09 \times 2) + (102.5 \times 2)}{12}$	1
	$= 99.56$	1
(d)	$I_{2013} = \frac{120}{100} \times 99.56$	1
	$= 119.47$	1
	TOTAL	10

14 (a) (i)	$\frac{\sin \angle ACB}{12} = \frac{\sin 30°}{7}$	1
	$\angle ACB = 59°$	1
(ii)	$\cos \angle AKB = \frac{4^2 + 11.47^2 - 12^2}{2(4)(11.47)}$	1
	$\cos \angle AKB = 0.0388$ $\angle AKB = 87.78°$ or $87°47'$	1
(iii)	$\angle ABC = 91°$	1
	Area $\triangle ABC$ = ½ (7)(12) sin 91° or Area of $\triangle AKB$ = ½ (4)(11.47) sin 87.78°	1
	Area of quadrilateral = Area $\triangle ABC$ + Area of $\triangle AKB$ = 41.99 + 22.92	1
	= 64.91 cm^2	1
(b)(i)		1
(ii)	$\angle A'C'B' = 121°$	1
	TOTAL	10

15 (*a*)(i)	$x + y \leq 10$ *or equivalent*	1
	$y - x \leq 4$ *or equivalent*	1
	$x \leq 2y$ *or equivalent*	1
(*b*)	Draw correctly one straight line from the inequalities	1
	Draw correctly two more straight line from the inequalities	1
	Region *R* correctly shaded	1
(*c*)(i)	Maximum point (3 , 7)	1
	RM [10(3) + 25(7)] = RM 205	1
(ii)	Minimum point (2 , 6)	1
	RM [10(2) + 25(6)] = RM 170	1
	TOTAL	10

GRAPH FOR QUESTION 7



GRAPH FOR QUESTION 15