## UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

## MARK SCHEME for the May/June 2006 question paper

## 0580 and 0581 MATHEMATICS

0580/04 and 0581/04

Paper 4, maximum raw mark 130

These mark schemes are published as an aid to teachers and students, to indicate the requirements of the examination. They show the basis on which Examiners were initially instructed to award marks. They do not indicate the details of the discussions that took place at an Examiners' meeting before marking began. Any substantial changes to the mark scheme that arose from these discussions will be recorded in the published *Report on the Examination*.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes must be read in conjunction with the question papers and the *Report on the Examination*.

The minimum marks in these components needed for various grades were previously published with these mark schemes, but are now instead included in the Report on the Examination for this session.

• CIE will not enter into discussion or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the May/June 2006 question papers for most IGCSE and GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.



Page 1	Mark Scheme	Syllabus	Paper
	IGCSE – May/June 2006	0580 and 0581	04

-		(1)	050 00		
1	(a)	(i)	850 ÷ 80	M1	
			10.625 (hrs) Must be exact	A1	
		(ii)	10 hours 37 mins 30 secs	B1	
	(b)	(i)	(0)6 08 (a.m.)	B1	
		(ii)	850 ÷ 10 hrs 48 mins	M1	
			<b>78.7 (km/hr)</b> (78.7037037)	A1	
	(c)	(i)	Increasing (more slowly)	B1	Accept speed going from 15 to 20.
		(ii)	Decreasing	B1	Accept accel. going from 12.5 to 0
		(iii)	$\frac{15-5}{1.8-1}$	M1	
			12.5 (m/s <sup>2</sup> )	A1	
		(iv)	20 x 7 or $\frac{1}{2} \times 3 \times 20$	M1	Alt Meth. 20 x 10 or
			$20 \times 7 \text{ or } \frac{1}{2} \times 3 \times 20$		$\frac{1}{2} \times 3 \times 20$
					2
			Second area <b>and</b> addition s.o.i. dep	M1	Sec. area <b>and</b> correct subtraction
			170 (m)	A1	
		(v)	Areas above and below broken line are approx. equal o.e.	B1	
		(vi)	(their 1 7 0 ÷ 10) x 3.6 o.e.	M1	
			61.2 (km/hr)	A1	16
2	(a)		Arc length = $\frac{\pi \times 24}{4}$ (18.8)	M1	
			Perimeter = 6 + 22 + 18 + 10 + their arc	M1	
			74.8 to 74.9 (cm)	A1	
	(b)		Sector area = $\frac{\pi \times 12^2}{4}$ (113)	M1	
			Area = (6 x 22) + (12 x 10) + their sector		
			0.e.	M1	
			365 to 365.2 (cm²)	A1	
	(c)		14600 to 14605 (cm <sup>3</sup> )	B1	
	(d)		their <b>(b)</b> x 2	M1	indep.
	. ,		their <b>(a)</b> x 40	M1	indep.
			Addition	M1	dep.
			3720 to 3730 (cm <sup>2</sup> )	A1	11
L					

Page 2	Mark Scheme	Syllabus	Paper
	IGCSE – May/June 2006	0580 and 0581	04

					,
3	(a)	(i)	1	B1	
		(ii)	-1	B1	
		(iii)	$\frac{3}{2}$ or $1\frac{1}{2}$ or 1.5	B1	
	(b)	(i)	( <i>r</i> =) 0.25	B1	These must be seen. No
			(s =) 1	B1	feedback from the graph.
			( <i>t</i> =) 8	B1	
		(ii)	Scales correct	S1	<i>x</i> from –2 to 3
					<i>y</i> to accommodate their values.
		(iii)	<b>Their 9 points plotted correctly</b> . They must be in correct square and within 1 mm.	Р3	ft P2 for 7 or 8 points correct.
					Ft P1 for 5 or 6 points correct.
			Smooth curve through all 9 points (1 mm)	C1	ft provided correct shape maintained.
	(c)	(i)	Correct ruled straight line of full length.	B2	SC1 for complete freehand line or for short correct ruled line crossing the curve and <i>y</i> -axis.
		(ii)	<b>1.52 to 1.57</b> (correct for their graph)	B1	Spoilt if <i>y</i> coordinate also given.
		(iii)	1	B1	15
4	(a)		Circle radius 5 cm (± 2 mm)	B1	
			Circle radius 2 cm (± 2 mm)	B1	
			AB is perpendicular to CD (± 1°)	B1	
			Lines parallel to roads at 0.5 cm from them (all 4 pairs) (Within 1 mm)	B1	
	(b)	(i)	Accurate (± 1°) angle bisector with arcs	B2	
		(ii)	T correct (± 1 mm) and labelled	T1	
	(c)		Accurate (± 1° and ± 1 mm)	B2	Ft SC1 if ± 2° and ± 2 mm
			perpendicular bisector of TB (using their T)		
			P correct (2.9 to 3.1 cm from 0) and labelled	B1	
	(d)		Their TP measured with km (±0.1 km)	B1	11

Page 3	Mark Scheme	Syllabus	Paper
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5	(a)		1 k		M1	
5	(a)		$y \propto \frac{1}{x^2}$ or $y = \frac{k}{x^2}$	0.e		
			$k = 4.8 \times 5^2$		A1	
	(b)		30		B1	
	(c)		$10x^2 = 120$	o.e.	M1	
			3.46	(3.464101)	A1	
	(d)		<i>x</i> <sup>2</sup> x <i>x</i> = 120	o.e.	M1	
			4.93	(4.932424)	A1	
	(e)		Divided by 4	0. <del>0</del> .	B2	<b>SC1</b> for $(2x)^2y = 120$ o.e. seen <u>or</u> a correct calculation using a value of <i>x</i> . e.g. $x = 4$ , $y = 7.5$
						<i>x</i> = 8, <i>y</i> = 1.875
	(f)		Increases by 25%	o.e.	B2	SC1 for 1.5625 seen
	(g)		Division by y		M1	
			Square root		M1	13
6	(a)		$(AC =) \sqrt{(8^2 + 6^2)}$		M1	
			$(PE =) \sqrt{(13^2 - [\frac{1}{2} \text{ their } A))}$	<i>C</i> ] <sup>2</sup> )	M1	dep.
			12		A1	
	(b)		$\frac{1}{3} \times 6 \times 8 \times \text{their } PE$		М1	
			192 (cm³)		A1	
	(c)		$\sin PCA = \frac{\text{their } PE}{13}$	(0.92307)	M1	$Cos = \frac{\text{their } CE}{13} \text{ Tan} = \frac{\text{their } PE}{\text{their } CE}$
			a.r.t. 67.4°	(67.380)	A1	
	(d)		$\tan PME = \frac{\text{their}PE}{4}$	(71.6°)	M1	$\tan MPE = \frac{4}{\text{their } PE} \qquad (18.4^\circ)$
			180 – 2 x angle <i>PME</i>	dep	M1	2 x angle <i>MPE</i>
			36.8° to 36.9°		A1	
	(e)	(i)	$\cos PBC = \frac{3}{13}$		M1	
			76.7°	(76.6576)	A1	
		(ii)	$(KC^2 = )4^2 + 6^2 - 2 \times 4 \times 6^2$	6 cos(their <i>PBC</i> )	M1	
			Square root of correct cor	mbination	M1	dep on first <b>M1</b> .
			√40.957 or 6.3998			
			6.40 (cm)		A1	15

Page 4	Mark Scheme	Syllabus	Paper
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TM(Q) = (k-3+3, k-2+2) seen M1 chosen and full working lead to $(k, k)$ = $(k, k)$ so $y = x$ E1 $(k, k)$	_	<u> </u>	<i>(</i> 1)		D.	]
(b) $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$ (c) $M(Q) = (k - 3, k - 2)$ seen $M1$ TM(Q) = (k - 3 + 3, k - 2 + 2) seen $M1= (k, k)$ so $y = x(d) \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}(e) (i) \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}(ii) Rotation B1Centre (0, 0) B1270^{\circ} \underline{or} clockwise 90^{\circ} B18 (a) (i) (x^2 - 40) + (x + 2) + (2x + 4) + x = 62 \text{ o.e.} M1x^2 + 4x - 96 = 0 o.e. A1(iii) x = -12 \text{ and } 8 c.a.o. A1(iii) 8(iv) 0.5 [(2 x \text{ their } 8 + 4) + (\text{their } 8^2 - 40)] x \text{ their}x = -12  and  8$ c.a.o. $A1(iii) \frac{p \pm \sqrt{q}}{r} where p = -(-8) \text{ and } r = 2 \times 2 o.e. M1\frac{p \pm \sqrt{q}}{r} where p = -(-8) \text{ and } r = 2 \times 2 o.e. M1Accept 0.5[2x + 4 + x^2 - 40]No error at any stage. = 0essential\frac{p \pm \sqrt{q}}{r} where p = -(-8) \text{ and } r = 2 \times 2 o.e. M1Accept 0.5[2x + 4 + x^2 - 40]$	<b>(</b>	(a)				
(c) $M(Q) = (k-3, k-2)$ seen $M1$ TM(Q) = (k-3, k-2) seen $M1TM(Q) = (k-3, k-2)$ seen $M1= (k, k)$ so $y = x(d) \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}(i) \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}(i) Rotation \\ Centre (0, 0) \\ 270^{\circ} or clockwise 90^{\circ}8 (a) (i) (x^2 - 40) + (x + 2) + (2x + 4) + x = 62 o.e. M1x^2 + 4x - 96 = 0 o.e. M1(x + 12)(x - 8) (=0)x = -12 and 8$ c.a.o. $A1(iii) kx = -12 and 8$ c.a.o. $A1(iii) 0.5 [(2x their 8 + 4) + (their 8^2 - 40)] x their M1(2y - 1)^2 = y^2 + (y + 2)^2 o.e. M1Accept 0.5[2x + 4 + x^2 - 40](2y - 1)^2 = y^2 + (y + 2)^2 o.e. M1Accept 0.5[2x + 4 + x^2 - 40]Accept 0.5[2x + 4 + x^2 $			(ii)			
$\begin{array}{c c c c c c c c c c c c c c c c c c c $		(b)			B2	<b>SC1</b> for a correct column
$\begin{array}{c c c c c c c c c c c c c c c c c c c $				$(1 \ 0)$		
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $		(c)		M(Q) = (k - 3, k - 2) seen	M1	<b>SC2</b> if a numerical value of <i>k</i> is
(d) $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$ (e) (i) $\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$ (ii) Rotation $\begin{pmatrix} 270^{\circ} \text{ or clockwise } 90^{\circ} \end{pmatrix}$ 8 (a) (i) $\begin{pmatrix} x^{2} - 40 \end{pmatrix} + \begin{pmatrix} x + 2 \end{pmatrix} + \begin{pmatrix} 2x + 4 \end{pmatrix} + x = 62 \text{ o.e.} \\ x^{2} + 4x - 96 = 0 \\ (ii) \\ (x + 12)(x - 8) (=0) \end{pmatrix}$ (iii) $\begin{pmatrix} x = -12 \text{ and } 8 \\ (x + 12)(x - 8) (=0) \end{pmatrix}$ (iv) $\begin{cases} 0.5 [(2 x \text{ their } 8 + 4) + (\text{their } 8^{2} - 40)] x \text{ their} \\ 8 \\ (y^{2} - 4y + 1 = y^{2} + y^{2} + 4y + 4 \\ y^{2} - 4y + 1 = y^{2} + y^{2} + 4y + 4 \\ 4y^{2} - 4y + 1 = y^{2} + y^{2} + 4y + 4 \\ 4y^{2} - 4y - 1 = y^{2} + y^{2} + 4y + 4 \\ 4y^{2} - 4y - 1 = y^{2} + y^{2} + 4y + 4 \\ 4y^{2} - 4y - 1 = y^{2} + y^{2} + 4y + 4 \\ 4y^{2} - 4y - 1 = y^{2} + y^{2} + 4y + 4 \\ 4y^{2} - 4y - 1 = y^{2} + y^{2} + 4y + 4 \\ 4y^{2} - 4y - 1 = y^{2} + y^{2} + 4y + 4 \\ 4y^{2} - 4y - 1 = y^{2} + y^{2} + 4y + 4 \\ 4y^{2} - 4y - 1 = y^{2} + y^{2} + 4y + 4 \\ 4y^{2} - 4y - 1 = y^{2} + y^{2} + 4y + 4 \\ 4y^{2} - 4y - 1 = y^{2} + y^{2} + 4y + 4 \\ 4y^{2} - 4y - 1 = y^{2} + y^{2} + 4y + 4 \\ 4y^{2} - 4y - 1 = y^{2} + y^{2} + 4y + 4 \\ 4y^{2} - 4y - 1 = y^{2} + y^{2} + 4y + 4 \\ 4y^{2} - 4y - 1 = y^{2} + y^{2} + 4y + 4 \\ 4y^{2} - 4y - 1 = y^{2} + y^{2} + 4y + 4 \\ 4y^{2} - 4y - 4y - 4y + 1 = y^{2} + y^{2} + 4y + 4 \\ 4y^{2} - 4y - 4y - 4y - 4y + 1 \\ 4y^{2} - 4y - 4y - 4y - 4y + 4 \\ 4y^{2} - 4y - 4y - 4y - 4y - 4y + 4 \\ 4y^{2} - 4y - 4y - 4y - 4y - 4y + 4 \\ 4y^{2} - 4y - 4y - 4y - 4y - 4y - 4y + 4 \\ 4y^{2} - 4y + 4 \\ 4y^{2} - 4y - 4$				TM(Q) = (k-3+3, k-2+2) seen	M1	chosen and <b>full working</b> leads to ( <i>k</i> , <i>k</i> )
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$				= ( <i>k</i> , <i>k</i> ) so <i>y</i> = <i>x</i>	E1	(k , k)
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		(d)		$ \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} $	B2	<b>SC1</b> for determinant = -1 <b>or</b> for "self-inverse"
(ii) Rotation B1 Centre (0, 0) B1 $270^{\circ} \text{ or clockwise 90^{\circ}}$ B1 8 (a) (i) $(x^2 - 40) + (x + 2) + (2x + 4) + x = 62$ o.e. M1 $x^2 + 4x - 96 = 0$ o.e. A1 (ii) $(x + 12)(x - 8) (=0)$ M1 $\frac{-4 \pm \sqrt{4^2 - 4.1 96}}{2}$ or better x = -12  and  8 c.a.o. A1 (iii) 8 0.5 [(2 x their 8 + 4) + (their 8^2 - 40)] x their M1 (iv) 0.5 [(2 x their 8 + 4) + (their 8^2 - 40)] x their M1 Accept 0.5[2x + 4 + x^2 - 40] (b) (i) $(2y - 1)^2 = y^2 + (y + 2)^2$ o.e. M1 $4y^2 - 4y + 1 = y^2 + y^2 + 4y + 4$ o.e. M1 $2y^2 - 8y - 3 = 0$ E1 dep No error at any stage. =0 essential (ii) $\frac{p \pm \sqrt{q}}{r}$ where $p = -(-8)$ and $r = 2 \times 2$ o.e M1 4.35 c.a.o. A1		(e)	(i)		B2	SC1 for 3 correct numbers.
Centre (0, 0) 270° <u>or</u> clockwise 90° <b>B</b> <b>B</b> <b>B</b> <b>B</b> <b>B</b> <b>B</b> <b>B</b> <b>B</b>				$(-1 \ 0)$		
$\begin{array}{ c c c c c c c c }\hline & 270^{\circ} & \underline{\text{or clockwise 90}^{\circ}} & \text{B1} \\ \hline 8 & (a) & (i) & (x^2 - 40) + (x + 2) + (2x + 4) + x = 62 & \text{o.e.} & \text{M1} \\ & x^2 + 4x - 96 = 0 & \text{o.e.} & \text{A1} \\ & (ii) & (x + 12)(x - 8) (= 0) & \text{M1} & \frac{-4 \pm \sqrt{4^2 - 4.1 96}}{2} \\ & & x = -12 & \underline{\text{and }} 8 & \text{c.a.o.} & \text{A1} \\ & & (iii) & 8 & \\ & (iv) & 0.5 & [(2 x \text{ their } 8 + 4) + (\text{their } 8^2 - 40)] \text{ x their} & \text{M1} \\ & & 176 & \text{c.a.o.} & \text{A1} \\ & & 176 & \text{c.a.o.} & \text{A1} \\ & & 4y^2 - 4y + 1 = y^2 + y^2 + 4y + 4 & \text{o.e.} & \text{M1} \\ & & 4y^2 - 4y + 1 = y^2 + y^2 + 4y + 4 & \text{o.e.} & \text{M1} \\ & & & 2y^2 - 8y - 3 = 0 & \text{E1} & \text{No error at any stage. =0} \\ & & & \text{ind } q = (-8)^2 - 4.2 3 & \text{o.e.} & \text{M1} \\ & & & \text{A1} & \text{A1} \end{array}$			(ii)	Rotation	B1	
8 (a) (i) $(x^2 - 40) + (x + 2) + (2x + 4) + x = 62$ o.e. M1 (ii) $x^2 + 4x - 96 = 0$ o.e. A1 (iii) $(x + 12)(x - 8) (=0)$ x = -12 and 8 c.a.o. A1 (iii) 8 (iv) 0.5 [(2 x their 8 + 4) + (their 8 <sup>2</sup> - 40)] x their 8 176 c.a.o. A1 (b) (i) $(2y - 1)^2 = y^2 + (y + 2)^2$ o.e. M1 $4y^2 - 4y + 1 = y^2 + y^2 + 4y + 4$ o.e. M1 $4y^2 - 4y + 1 = y^2 + y^2 + 4y + 4$ o.e. M1 $4y^2 - 4y + 1 = y^2 + y^2 + 4y + 4$ o.e. M1 $4y^2 - 4y - 3 = 0$ (ii) $\frac{p \pm \sqrt{q}}{r}$ where $p = -(-8)$ and $r = 2 \times 2$ o.e M1 and $q = (-8)^2 - 4.2 3$ o.e M1 4.35 c.a.o. M1				Centre (0 , 0)	B1	
(ii) $x^2 + 4x - 96 = 0$ o.e. A1 (iii) $(x + 12)(x - 8) (=0)$ (iii) $x = -12$ and 8 c.a.o. A1 (iii) $8$ (iv) $0.5 [(2 x their 8 + 4) + (their 8^2 - 40)] x their 81 (iv) 0.5 [(2 x their 8 + 4) + (their 8^2 - 40)] x their 81 (b) (i) (2y - 1)^2 = y^2 + (y + 2)^2 o.e. A14y^2 - 4y + 1 = y^2 + y^2 + 4y + 4 o.e. M14y^2 - 8y - 3 = 0(ii) \frac{p \pm \sqrt{q}}{r} where p = -(-8) and r = 2 \times 2 o.e A1and q = (-8)^2 - 4.2 3 o.e M14.35 c.a.o. M1(b) (c) x^2 + 4x + x^2 - 40(c) x^2 + 4x + x^2 + 4x + 4x^2 $				270° <u>or</u> clockwise 90°	B1	15
(ii) $(x + 12)(x - 8) (=0)$ (iii) $x = -12 \text{ and } 8$ (iii) $x = -12 \text{ and } 8$ (iii) $x = -12 \text{ and } 8$ (iii) $x = -12 \text{ and } 8$ (iv) $0.5 [(2 x their 8 + 4) + (their 8^2 - 40)] x their 8$ (iv) $0.5 [(2 x their 8 + 4) + (their 8^2 - 40)] x their 8$ 176 (i) $(2y - 1)^2 = y^2 + (y + 2)^2$ o.e. A1 (b) (i) $(2y - 1)^2 = y^2 + (y + 2)^2$ o.e. M1 (2y^2 - 4y + 1 = y^2 + y^2 + 4y + 4 o.e. 2y^2 - 8y - 3 = 0 (ii) $\frac{p \pm \sqrt{q}}{r}$ where $p = -(-8)$ and $r = 2 \times 2$ o.e and $q = (-8)^2 - 4.2 3$ o.e M1 (iii) $\frac{p \pm \sqrt{q}}{r}$ where $p = -(-8)$ and $r = 2 \times 2$ o.e M1 (iv) $\frac{p \pm \sqrt{q}}{r}$ where $p = -(-8)$ and $r = 2 \times 2$ o.e M1 (iv) $\frac{p \pm \sqrt{q}}{r}$ where $p = -(-8)$ and $r = 2 \times 2$ o.e M1 (iv) $\frac{p \pm \sqrt{q}}{r}$ where $p = -(-8)$ and $r = 2 \times 2$ o.e M1 (iv) $\frac{p \pm \sqrt{q}}{r}$ where $p = -(-8)$ and $r = 2 \times 2$ o.e M1 (iv) $\frac{p \pm \sqrt{q}}{r}$ where $p = -(-8)$ and $r = 2 \times 2$ o.e M1 (iv) $\frac{p \pm \sqrt{q}}{r}$ where $p = -(-8)$ and $r = 2 \times 2$ o.e M1 (iv) $\frac{p \pm \sqrt{q}}{r}$ where $p = -(-8)$ and $r = 2 \times 2$ o.e M1 (iv) $\frac{p \pm \sqrt{q}}{r}$ where $p = -(-8)$ and $r = 2 \times 2$ o.e M1 (iv) $\frac{p \pm \sqrt{q}}{r}$ where $p = -(-8)$ and $r = 2 \times 2$ o.e M1 (iv) $\frac{p \pm \sqrt{q}}{r}$ where $p = -(-8)$ and $r = 2 \times 2$ o.e M1 (iv) $\frac{p \pm \sqrt{q}}{r}$ where $p = -(-8)$ and $r = 2 \times 2$ o.e M1 (iv) $\frac{p \pm \sqrt{q}}{r}$ where $p = -(-8)$ and $r = 2 \times 2$ o.e M1 (iv) $\frac{p \pm \sqrt{q}}{r}$ where $p = -(-8)$ and $r = 2 \times 2$ o.e M1 (iv) $\frac{p \pm \sqrt{q}}{r}$ where $p = -(-8)$ and $r = 2 \times 2$ o.e M1 (iv) $\frac{p \pm \sqrt{q}}{r}$ where $p = -(-8)$ and $r = 2 \times 2$ o.e M1 (iv) $\frac{p \pm \sqrt{q}}{r}$ where $p = -(-8)$ and $r = 2 \times 2$ o.e M1 (iv) $\frac{p \pm \sqrt{q}}{r}$ where $p = -(-8)$ and $r = 2 \times 2$ o.e M1 (iv) $\frac{p \pm \sqrt{q}}{r}$ where $p = -(-8)$ and $r = 2 \times 2$ o.e M1 (iv) $\frac{p \pm \sqrt{q}}{r}$ and $\frac{p \pm \sqrt{q}}$	8	(a)	(i)	$(x^2 - 40) + (x + 2) + (2x + 4) + x = 62$ o.e.	M1	
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$				$x^2 + 4x - 96 = 0$ o.e.	A1	
$ \begin{array}{ c c c c c c c c } & x = -12 & and & 8 & c.a.o. & A1 & B1 & B1 & B1 & B1 & B1 & B1 & B1$			(ii)	(x + 12)(x - 8) (=0)	M1	$\frac{-4 \pm \sqrt{4^2 - 4.1 96}}{2}$
(iii) 8 (iv) 0.5 [(2 x their 8 + 4) + (their 8 <sup>2</sup> -40)] x their M1 Accept 0.5[2x + 4 + x <sup>2</sup> - 40] (b) (i) (2y - 1) <sup>2</sup> = y <sup>2</sup> + (y + 2) <sup>2</sup> o.e. M1 $4y^2 - 4y + 1 = y^2 + y^2 + 4y + 4$ o.e. M1 dep $2y^2 - 8y - 3 = 0$ E1 No error at any stage. =0 (ii) $\frac{p \pm \sqrt{q}}{r}$ where $p = -(-8)$ and $r = 2 \times 2$ o.e M1 and $q = (-8)^2 - 4.2 3$ o.e M1 4.35 c.a.o. M1						or better
(iv) 0.5 [(2 x their 8 + 4) + (their 8 <sup>2</sup> -40)] x their 8 176 c.a.o. A1 (b) (i) $(2y-1)^2 = y^2 + (y+2)^2$ o.e. M1 $4y^2 - 4y + 1 = y^2 + y^2 + 4y + 4$ o.e. M1 $2y^2 - 8y - 3 = 0$ (ii) $\frac{p \pm \sqrt{q}}{r}$ where $p = -(-8)$ and $r = 2 \times 2$ o.e and $q = (-8)^2 - 4.2 3$ o.e M1 4.35 c.a.o. A1 M1 Accept 0.5[2x + 4 + x <sup>2</sup> - 40] M1 Accept 0.5[2x + 4 + x <sup>2</sup> - 40] M1 At an and a period a set of the						
(b) (i) $\begin{array}{cccccccccccccccccccccccccccccccccccc$						
(b) (i) $(2y-1)^2 = y^2 + (y+2)^2$ o.e. M1 $4y^2 - 4y + 1 = y^2 + y^2 + 4y + 4$ o.e. M1 $2y^2 - 8y - 3 = 0$ (ii) $\frac{p \pm \sqrt{q}}{r}$ where $p = -(-8)$ and $r = 2 \times 2$ o.e and $q = (-8)^2 - 4.2 3$ o.e M1 4.35 c.a.o. M1			(iv)		M1	Accept 0.5[2x + 4 + $x^2$ – 40] x x
(ii) $\begin{array}{c} 4y^2 - 4y + 1 = y^2 + y^2 + 4y + 4 & \text{o.e.} \\ 2y^2 - 8y - 3 = 0 \end{array} \qquad \begin{array}{c} \text{M1} \\ \text{E1} \\ \text{M2} \\ \text{E1} \\ \text{No error at any stage. =0} \\ \text{essential} \end{array}$					A1	
(ii) $\begin{array}{c} 2y^{2} - 8y - 3 = 0 \\ \frac{p \pm \sqrt{q}}{r} \text{ where } p = -(-8) \text{ and } r = 2 \times 2 \text{ o.e} \\ \text{and } q = (-8)^{2} - 4.2 3 \\ 4.35 \text{ c.a.o.} \end{array}  \begin{array}{c} \text{E1} \\ \text{M1} \\ \text{M1} \\ \text{M1} \\ \text{M1} \\ \text{M1} \end{array}$		(b)	(i)	$(2y-1)^2 = y^2 + (y+2)^2$ o.e.	M1	
(ii) $\begin{array}{c} 2y^{2} - 8y - 3 = 0 \\ \frac{p \pm \sqrt{q}}{r} \text{ where } p = -(-8) \text{ and } r = 2 \times 2 \text{ o.e} \\ \text{and } q = (-8)^{2} - 4.2 3 \\ 4.35 \text{ c.a.o.} \end{array}  \begin{array}{c} \text{E1} \\ \text{M1} \\ \text{M1} \\ \text{M1} \\ \text{M1} \\ \text{M1} \end{array}$				$4y^2 - 4y + 1 = y^2 + y^2 + 4y + 4$ o.e.	M1	dep
(ii) $\frac{p \pm \sqrt{q}}{r}$ where $p = -(-8)$ and $r = 2 \times 2$ o.e and $q = (-8)^2 - 4.2 3$ o.e A1 4.35 c.a.o. A1				$2y^2 - 8y - 3 = 0$	E1	
<b>4.35</b> c.a.o. <b>A1</b>			(ii)	$\frac{p \pm \sqrt{q}}{r}$ where $p = -(-8)$ and $r = 2 \times 2$ o.e	M1	
<b>4.35</b> c.a.o. <b>A1</b>					M1	
– <b>0.35</b> c.a.o. <b>A1</b>				<b>4.35</b> c.a.o.	A1	
				<b>-0.35</b> c.a.o.	A1	
(iii) 13.8 c.a.o. (13.81125) B2 SC1 for $\frac{y(y+2)}{2}$ seen			(iii)	<b>13.8</b> c.a.o. (13.81125)	B2	<b>SC1</b> for $\frac{y(y+2)}{2}$ seen <b>16</b>

Page 5	Mark Scheme	Syllabus	Paper
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9	(a)	(i)	1	B1	
	( )	(ii)	3	B1	
		(iii)	29 + their $k + m$	M1	
		. ,	$\frac{29 + 11011 \times + 111}{10} = 3.6$ o.e.		
			(m =) 4	A1	
		(iv)	9	B1	
	(b)	(i)	mid-values 10, 25, 32.5, 37.5, 45, 55, 70 seen	M1	At least 6 correct s.o.i.
			(10 x 10) + (10 x 25) + (15 x 32.5) + (28 x 37.5) + (22 x 45) + (7 x 55) + (8 x 70)	M1*	Dep on first <b>M1 <u>or</u></b> mid-values ±0.5 Allow 1 more slip.
			[3822.5]		
			Total ÷ 100	M1	Dep on second M1*
			<b>38.2</b> (38.225)	A1	
		(ii)	$\frac{15}{100} \times \frac{14}{99}$	M1	
			<b>210</b> <b>9900</b> o.e.	A1	
			7Final Answer	A1	
	(c)	(i)	<i>p</i> = 20	B1	
			<i>q</i> = 72	B1	
		(ii)	Horizontal scale correct	S1	Implied by correct use. Ignore the vertical scale.
			For each block of correct width		For scale error (halved), award
			Height 3.3 cm	H1	H1, H1, H1 for correct <b>ft</b> heights.
			Height 12 cm	H1	
			Height 2 cm	H1	After H0, H0, H0, give <b>SC1</b> for <u>correct</u> frequency densities written. <b>(0.67, 2.4, 0.4)</b> 18