UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2010 question paper for the guidance of teachers

0581 MATHEMATICS

0581/41

Paper 41 (Extended), maximum raw mark 130

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

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F	Page 2	Mark Scheme: Teachers' version	Syllabus
		IGCSE – May/June 2010	0581
	eviations		Cany
cao cso	correct answ	•	Tak
dep	dependent	•	a in
ft		gh after error	TOM
isw	•	equent working	
oe	or equivalen	t	

Abbreviations

follow through after error ignore subsequent working or equivalent Special Case ft isw

oe SC

without wrong working www

Qu.	Answers	Mark	Part Marks
1 (a)	11:14	1	
(b)	50	2	M1 for $(220 + 280) \div 10$ o.e.
(c)	12	2	M1 for $21 \div (4+3) \times 4$ (or 3) o.e.
(d)	280	3	M1 for 0.35 × their 500 (175) M1 dependent × 1.60
(e)	240	2	M1 for dividing 264 by 1.1 oe
2 (a) (i)	4	1	
(ii)	5	1	
(iii)	4.75	3	M1 for $1 \times 2 + 1 \times 3 + 17 \times 4 + 12 \times 5 + 6 \times 6 + 3 \times 7$ condone one slip then M1 dependent result $(190) \div 40$
(b)	$\frac{190+3n}{40+n}$	2	SC1 for their $190 + 3n$
3 (a)	Triangle drawn with co-ords at (1, 4),	2	SC1 for 2 correct vertices or an enlargement sf
	(4, 2), (4, 4)		$\frac{1}{2}$ with wrong centre
(b) (i)	$\begin{pmatrix} -8 & -8 & -2 \\ 4 & 8 & 8 \end{pmatrix}$	2	B1 each row
(ii)	Triangle drawn at $(-8, 4), (-8, 8), (-2, 8)$ ft (i)	2ft	SC1 for 2 correct ft vertices. Can also be correct regardless of (i)
(iii)	Reflection cao $y - axis \text{ or } x = 0$ cao	2	B1 Independent of (i) or (ii) Extra transformations lose all marks B1 Independent of (i) or (ii)
(c) (i)	Translation		B1 Extra transformations lose all marks
	$\begin{pmatrix} -10 \\ -10 \end{pmatrix}$ o.e.	2	B1
(ii)	Rotation (0, 0) 90° clockwise oe	3	B1 Extra transformations lose all marks B1 Allow word origin for (0, 0) B1 Allow – 90° or 270° (anti-clockwise)
(d)	$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$	2	B1 each column

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				93.
4				In (b) and (c) isw any cancelling or charto other forms, after correct answer seem. Penalty of – 1 for 2 sf decimals or percentages. Do not accept ratio or worded forms.
(a)	B and $\frac{2}{5}$, $\frac{1}{4}$ oe		1	Allow any reasonable explanation, e.g. 2 out of 5 greater than 1 out of 4.
	$\frac{1}{3}, \frac{3}{4}, \frac{2}{5}, \frac{3}{5}$		4	B1 B1 B1 B1
(ii)	$\frac{6}{12}$ oe cao	www 2	2	$\frac{1}{2}$, 0.5 etc M1 for $\frac{2}{3}$ × their $\frac{3}{4}$ i.e. product of correct branches on their tree
(iii)	$\frac{42}{60}$ oe cao	www2	2	$\frac{7}{10}$, 0.7 etc M1 for their (ii) + their $\frac{1}{3}$ × their $\frac{3}{5}$ from their
(c)	$\frac{2}{60}$ oe cao	www2	2	tree $ \frac{1}{30}, 0.0333(3) \text{ etc} $ M1 for $\left(\frac{2}{3} \times \frac{1}{4} \times 0\right) + \frac{1}{3} \times \frac{2}{5} \times \frac{1}{4}$
5 (a)	200.5 to 201	www 2	2	M1 for $0.5 \times 24 \times 26 \sin 40$ oe A1
(b)	17.2 (0)	www 4	4	M2 for $26^2 + 24^2 - 2 \times 26 \times 24 \cos 40$ or M1 for $\cos 40 = \frac{26^2 + 24^2 - BD^2}{2 \times 24 \times 26}$ A2 or A1 for 295.976
(c)	12.8 (12.77)	www 4	4	B1 for Angle $C = 110$ soi accept on diagram M2 for $(BC) = \frac{24 \sin 30}{\sin 110}$ oe or M1 $\frac{\sin 110}{24} = \frac{\sin 30}{BC}$ oe i.e. a correct implicit statement soi A1
(d)	8.208 to 8.230	www 2	2	M1 for their (c) × sin40 oe

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Histogram drawn 3 B1 Bars correct positions and widths - no g B2 Heights of bars 1, 1.5 and 2 (B1 for any two correct or for heights in the ratio 2:3:4) (a) 4.53 or 4.526 - 4.530 3 SC2 for figs 453 or 4526 - 4530 If SC0, M1 for π × (figs 31)² × 15 (b) 3.62 to 3.624 ft 2ft M1 for their (a) × figs 8 oe (c) (i) 360 - 2 × 90 - 60 oe 2 E2 The 90's and the 60 must be clearly justified. Accept in diagram. SC1 for 60 or two 90's soi in correct position: e.g 360 ÷ 3 scores 0 (ii) 0.649 (0.6492 to 0.6493) 2 M1 for π × figs 62 ÷ 3 M1 for their (ii) × 3 M1 (indep) for 18 × figs 31 This M is spoiled by extra lengths. (iv) 112.9 to 113 ft 1ft ft their (iii) × 15 M1 B1 B1 B1 B1 B1 B1 B1 B1 B1 B1 B1 B1 B1 B1 B1	Histogram drawn $.53 \text{ or } 4.526 - 4.530$ $.62 \text{ to } 3.624 \text{ ft}$ $.60 - 2 \times 90 - 60 \text{ oe}$	Histogram drawn 4.53 or 4.526 – 4.530 3.62 to 3.624 ft	M1 for use interval (10 × 15 + 3 M1 ÷ 60 de 3 B1 Bars cor B2 Heights two correct 3 SC2 for figg If SC0, M1 2ft M1 for their	of Σfx with x's anywhere in each $30 \times 30 + 20 \times 45$) ependent on second M1 rect positions and widths – no gaps of bars 1, 1.5 and 2 (B1 for any or for heights in the ratio 2:3:4) at 453 or $4526 - 4530$ for $\pi \times (\text{figs } 31)^2 \times 15$ r (a) \times figs 8 oe
B2 Heights of bars 1, 1.5 and 2 (B1 for any two correct or for heights in the ratio 2:3:4) (a)	$0.53 \text{ or } 4.526 - 4.530$ $0.62 \text{ to } 3.624 \text{ ft}$ $0.60 - 2 \times 90 - 60 \text{ oe}$	4.53 or 4.526 – 4.530 3.62 to 3.624 ft	B2 Heights two correct 3 SC2 for figs If SC0, M1 2ft M1 for their	of bars 1, 1.5 and 2 (B1 for any or for heights in the ratio 2:3:4) s 453 or $4526 - 4530$ for $\pi \times (\text{figs } 31)^2 \times 15$ r (a) \times figs 8 oe
If SC0, MI for $\pi \times (\text{figs } 31)^2 \times 15$ If SC0, MI for $\pi \times (\text{figs } 31)^2 \times 15$ MI for their (a) \times figs 8 oe 2	$.62 \text{ to } 3.624 \text{ ft}$ $60 - 2 \times 90 - 60 \text{ oe}$	3.62 to 3.624 ft	2ft If SC0, M1 2ft M1 for their	for $\pi \times (\text{figs } 31)^2 \times 15$ r (a) × figs 8 oe
(c) (i) $360 - 2 \times 90 - 60$ oe	$60 - 2 \times 90 - 60$ oe			` '
justified. Accept in diagram. SC1 for 60 or two 90's soi in correct positions e.g 360 ÷ 3 scores 0 (ii) 0.649 (0.6492 to 0.6493) (iii) 7.53 (7.527 or 7.528) 3 M1 for their (ii) × 3 M1 (indep) for 18 × figs 31 This M is spoiled by extra lengths. (iv) 112.9 to 113 ft 1ft ft their (iii) × 15 (a) 0.25, 8, 16 3 B1 B1 B1 (b) -5, 4 2 B1 B1 (c) (i) 7 points plotted ft Curve through all 7 points exponential P2ft ft only if exponential shape		$360 - 2 \times 90 - 60$ oe	2 E2 E1 - 002	
(iii) 7.53 (7.527 or 7.528) 3 M1 for their (ii) × 3 M1 (indep) for 18 × figs 31 This M is spoiled by extra lengths. (iv) 112.9 to 113 ft 1ft ft their (iii) × 15 (a) 0.25, 8, 16 3 B1 B1 B1 (b) -5, 4 2 B1 B1 (c) (i) 7 points plotted ft Curve through all 7 points exponential P2ft ft only if exponential shape	.649 (0.6492 to 0.6493)		justified. Ac SC1 for 60 c	ccept in diagram. or two 90's soi in correct positions oe
M1 (indep) for 18 × figs 31 This M is spoiled by extra lengths. (iv) 112.9 to 113 ft Ift ft their (iii) × 15 (a) 0.25, 8, 16 3 B1 B1 B1 (b) -5, 4 2 B1 B1 (c) (i) 7 points plotted ft Curve through all 7 points exponential P2ft Curve through if exponential shape		0.649 (0.6492 to 0.6493)	2 M1 for $\pi \times$	figs 62 ÷ 3
(a) 0.25, 8, 16 3 B1 B1 B1 (b) -5, 4 2 B1 B1 (c) (i) 7 points plotted ft Curve through all 7 points exponential C1ft ft only if exponential shape	.53 (7.527 or 7.528)	7.53 (7.527 or 7.528)	M1 (indep)	for 18 × figs 31
(b) -5,4 2 B1 B1 (c) (i) 7 points plotted ft Curve through all 7 points exponential C1ft ft only if exponential shape	12.9 to 113 ft	112.9 to 113 ft	1ft ft their (iii)	× 15
(c) (i) 7 points plotted ft P2ft Curve through all 7 points exponential C1ft ft only if exponential shape	.25, 8, 16	0.25, 8, 16	3 B1 B1 B1	
Curve through all 7 points exponential C1ft ft only if exponential shape	5, 4	-5, 4	2 B1 B1	
Shape	Curve through all 7 points exponentia			
(ii) 6 points plotted ft Curve through all 6 points parabola shape P2ft C1ft P1 for 5 points ft ft only if parabola shape	Curve through all 6 points parabola	Curve through all 6 points parabola	1	
(d) (i) 3.2 to 3.4	.2 to 3.4	3.2 to 3.4	1	
(ii) 0.3 to 0.4 and 2 2 B1 B1	.3 to 0.4 and 2	0.3 to 0.4 and 2	2 B1 B1	
(iii) 3.1 to 3.4	.1 to 3.4	3.1 to 3.4	1	
(a) (i) -2.5 oe 2 M1 for $5(w+1) = 3w$	2.5 oe	-2.5 oe	2 M1 for 5(w	+1)=3w
(ii) $-3 \text{ or } 1$ 2 B1 B1 (If 0, SC1 for $y + 1 = \pm 2$)	3 or 1	−3 or 1	2 B1 B1 (If 0), SC1 for $y + 1 = \pm 2$)
(iii) 9.5 oe B3 M2 for $5x + 5 - 3x + 6 = 2 \times 15$ Condone of slip (sign or numerical) on left hand side or M1 for $\frac{5(x+1)}{15} - \frac{3(x-2)}{15}$ or better,	.5 oe	9.5 oe	slip (sign or	numerical) on left hand side
condoning one sign or numerical slip.				

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		I	17/1
(b) (i)	(u-10)(u+1)	2	SC1 for $(u+a)(u+b)$ where $ab = -10$ a+b=-9 Only ft B2 or SC1 in (i) but can recover to correct answer only if new working or if (i) not
(ii)	-1, 10	1 ft	Only ft B2 or SC1 in (i) but can recover to correct answer only if new working or if (i) not attempted
(c) (i)	$\frac{(x+1)(x+2)}{2} = x^2 \qquad \text{oe}$ $((x+1)(x+2) =)x^2 + x + 2x + 2$	M1	
	$((x+1)(x+2) =)x^2 + x + 2x + 2$	B1	Allow $3x$ for $x + 2x$
	$x^2 + x + 2x + 2 = 2x^2$		
	$x^2 - 3x - 2 = 0$	E1	Established without any omissions or errors
(ii)	$x^{2} - 3x - 2 = 0$ $\frac{-(-3) \pm \sqrt{(-3)^{2} - 4(1)(-2)}}{2(1)}$	2	B1 for $\sqrt{(-3)^2 - 4(1)(-2)}$ or better seen anywhere.
			If in form $\frac{p+\sqrt{q}}{r}$ or $\frac{p-\sqrt{q}}{r}$ then B1 for
			-(-3) and 2(1) or better
			Brackets and full line may be implied later
	-0.56, 3.56	2	B1 B1 SC1 for -0.6 or -0.562 to -0.561 and 3.6 or 3.561 to 3.562
(iii)	12.7 or 12.67 to 12.69 ft	1 ft	ft their positive <i>x</i> squared
10 (a)	$20x + 100y \le 1200$	1	
(b)(i)	$x + y \ge 40$	1	
(ii)	$y \ge 2$	1	
(c)	x + y = 40 cao	L1	Each line ruled and long enough to enclose
	y = 2 cao	L1	required region. If L0 , SC1 if freehand but otherwise accurate and enclose region
	Required region only region left not shaded or otherwise clearly indicated cao	R2	SC1 if one boundary error – see diagrams
(d)	5 cao	1	
(e)	50 cao, 2 cao 270 ft	2 1 ft	B1 B1 ft $5 \times \text{their } x + 10 \times \text{their } y$
11 (a)	Reasonable diagram, 25, 13, 62	4	B1 B1 B1 B1 diagram may be freehand
(b)	64, 19, 146	3	B1 B1 B1
(c)	n^2 oe		B1
Z 30 ZA	2n+3 oe	2	B1
(d)(i)	2	1	6.1010147
(ii)	20202 ft	1 ft	ft 10101 × their <i>k</i>