

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

<p>0581 MATHEMATICS</p> <p>0581/42 Paper 42 (Extended), maximum raw mark 130</p>

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Abbreviations

cao	correct answer only
cso	correct solution only
dep	dependent
ft	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
www	without wrong working

Qu.	Answers	Mark	Part Marks
1 (a)	$240 \div 8 \times 3$ or $240 \div 8 \times 5$ or $\frac{3}{8}$ of 240 or $\frac{5}{8}$ of 240 oe	1	Accept reverse e.g. $90 : 150 = 3 : 5$ and $90 + 150 = 240$
(b) (i)	5 www 2	2	M1 for $\frac{100 \times 9}{90 \times 2}$ oe
(ii)	165 www 2	2	M1 for $99 \div 0.6$ oe
(c)	162.24 final answer cao	2	M1 for $150 \times 1.04 \times 1.04$ oe implied by answer 162.2
(d) (i)	58.67 final answer cao	3	SC2 for 58.7 or M1 for $\frac{150 \times 4 \times 20}{100}$ oe (120) then M1 (dependent on the first M1) $328.67 - 150 -$ their 120 oe Answers of 208.67 or 208.7 imply first M1
(ii)	219 (.1....) www 2	2	M1 for $\frac{328.67}{150} \times 100$ oe
2 (a) (i)	$\binom{15}{8}$	2	B1 each component
(ii)	17 www 2	2ft	ft their 15 and their 8. M1 for $(\text{their } 15)^2 + (\text{their } 8)^2$
(b) (i)	$\frac{1}{2}\mathbf{v} - \frac{1}{2}\mathbf{c}$ or $\frac{1}{2}(\mathbf{v} - \mathbf{c})$ cao	2	M1 for $\frac{1}{2}\overrightarrow{CV}$ soi
(ii)	$\frac{1}{2}\mathbf{c} + \frac{1}{2}\mathbf{v}$ again allowing brackets cao	2	M1 for \overrightarrow{OM} e.g. $\overrightarrow{OC} + \overrightarrow{CM}$ or better seen or $\mathbf{v} -$ their (i) or $\mathbf{c} +$ their (i)
(iii)	$\frac{1}{6}\mathbf{v} - \frac{1}{2}\mathbf{c}$ again allowing brackets cao	2	M1 for any correct route e.g. $\overrightarrow{MV} + \overrightarrow{VL}$ or their (i) $-\frac{1}{3}\mathbf{v}$ or $\frac{2}{3}\mathbf{v} -$ their (b)(ii)

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3			Throughout this question isw any can or changing to other forms, after correct answer seen. Penalty of –1 for 2 sf decimals or percentages. Do not accept ratio or worded forms.
	(a) (i)	$\frac{4}{6}$ oe (0.667)	1 Allow 0.6666 – 0.6667
	(ii)	$\frac{3}{6}$ oe	1
	(iii)	$\frac{2}{6}$ oe (0.333)	1 Allow 0.3333...
	(iv)	$\frac{5}{6}$ oe (0.833)	1 Allow 0.8333...
	(b) (i)	$\frac{1}{36}$ oe (0.0278)	2 Allow 0.02777 – 0.02778, M1 for $\frac{1}{6} \times \frac{1}{6}$
	(ii)	$\frac{6}{36}$ oe (0.167) www 2	2 Allow 0.1666 – 0.1667, M1 for $\frac{3}{6} \times \frac{1}{6} \times 2$ oe
	(c) (i)	$\frac{1}{4}$ oe	1
	(ii)	$\frac{1}{2}$ oe	1
	(d)	5 (but not from rounding)	2 M1 for repeating $\times \frac{4}{6}$ oe e.g. $\left(\frac{2}{3}\right)^n$
4	(a) (i)	Triangle with vertices (–4, 4), (–1, 4), (–1, 6)	2 SC1 for translation $\begin{pmatrix} -7 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 3 \end{pmatrix}$
	(ii)	Triangle with vertices (1, –3), (1, –6), (3, –6)	2 SC1 two correct vertices or 90° anticlockwise about (0, 0)
	(b) (i)	Reflection only $y = -x$ oe	1 Marks independent but must be single 1 transformation to score any marks
	(ii)	Stretch only x -axis oe invariant (factor) 3	1 Marks independent but must be single 1 transformation to score any marks 1 1

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(c) (i)	$\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$	2	B1 each column
(ii)	$\begin{pmatrix} 1 & 0 \\ 0 & 3 \end{pmatrix}$ ft	2ft	ft factor in (b)(ii) only if stretch and can recover to correct matrix SC1ft for right-hand column
(iii)	$\begin{pmatrix} 1 & 0 \\ 0 & \frac{1}{3} \end{pmatrix}$ ft	1ft	ft $\begin{pmatrix} 1 & 0 \\ 0 & n \end{pmatrix}$ to $\begin{pmatrix} 1 & 0 \\ 0 & \frac{1}{n} \end{pmatrix}$ or $\begin{pmatrix} n & 0 \\ 0 & 1 \end{pmatrix}$ to $\begin{pmatrix} \frac{1}{n} & 0 \\ 0 & 1 \end{pmatrix}$ $n \neq 0, \pm 1$ for $\frac{1}{3}$, allow 0.33 or better
5 (a)	$(\cos) \frac{180^2 + 115^2 - 90^2}{2 \times 180 \times 115}$ 24.98 – 24.99	M2 A2	M1 for correct implicit expression $90^2 = \dots\dots$ A1 for $(\cos) = 0.9064\dots$
(b) (i)	125(.0....) ft	1ft	ft 150 – their (a)
(ii)	305(.0....) ft	1ft	ft 180 + their (b)(i)
(c)	180sin (54.98 to 55) or 180cos (35 to 35.02) oe or 180sin (360 – their (b)(ii)) or 180cos(their (b)(i) – 90) oe 147(.4....) cao www 3	M2 A1	B1 for 54.98 to 55 or 35 to 35.02 soi in correct position. Provided either angle is acute
(d)	$\frac{90 \sin 30}{\sin 70}$ 47.9 (47.88 – 47.89) cao www 3	M2 A1	M1 for $\frac{TR}{\sin 30} = \frac{90}{\sin 70}$ or other correct implicit equation
(e)	2 000 000 oe	2	Allow 1 : 2 000 000 as answer. SC1 figs 2 in answer which could be a ratio.
6 (a)	$\frac{4}{3} \pi \times 2.4^3$ 57.87 – 57.92 to at least 4 figures	M1 A1	Must see method
(b) (i)	14.4, 9.6, 4.8	1, 1, 1	Any order
(ii)	664 (663.5 – 663.6) ft	1ft	
(iii)	315 or 316 or 317 (315.2 – 316.8) ft	1ft	ft their (b)(ii) – 6 × ‘57.9’ (only if positive)
(iv)	507 (506.8 – 506.9) ft	2ft	M1 for $(14.4 \times 9.6 + 14.4 \times 4.8 + 9.6 \times 4.8) \times 2$ or their 3 lengths.

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(c) (i)	Height seen or implied as 6×4.8 or better $\pi \times 2.4^2 \times$ their height 521 (520.8 – 521.3) www 3	M1 M1 A1	Indep
(ii)	174 or 173 (173.2 – 174.1) ft	1ft	ft their (c)(i) – $6 \times '57.9'$ only if positive
(iii)	470 – 471 cao www 3	3	M1 for $2 \times \pi \times 2.4^2$ (36.17 to 36.2), and M1 indep for $\pi \times 4.8 \times$ their height from (c)(i)
7 (a)	$12 \times 2.5 + 15 \times 7.5 + 23 \times 12.5 + 30 \times 17.5 + 40 \times 22.5 + 35 \times 27.5 + 25 \times 32.5 + 20 \times 37.5$ $\div 200$ 21.9 www 4	M1 M1 M1 A1	mid-values any three soi Use of Σfx dep on x anywhere in each interval (including lower bound) – allow 2 slips or omissions Depend on second M
(b)	155, 180	1	
(c)	8 points plotted ft, ignoring (0, 0) Reasonable <u>increasing</u> curve or polygon through their 8 points	P3ft C1ft	P2ft for 6 or 7 plotted, P1ft for 4 or 5 plotted Condone starting at (5, 12) and ft only if shape correct.
(d)	Either horizontal or vertical line at least 1 cm long at $y = 50$ on the curve	1	
(e) (i)	22 – 23	1	
(ii)	13.5 – 14.5	1	
(iii)	25.5 – 26.5	1	
(iv)	136 – 140 must be integer	2	SC1 for 60 – 64 seen and must be integer
8 (a)	$(p + q)^2 - 5$ oe final answer	2	SC1 for $(p + q)^2$ oe seen
(b)	$6x + 9(x - 3) = 51$ or better 5.2(0) final answer	B3 B1	B2 for $6x + 9(x - 3)$ or B1 for $6x$ or $9(x - 3)$ 5.2(0) ww is B1 only
(c)	$a + c = 52$ oe $3a + 2c = 139$ oe Correctly eliminating a or c . 35 17	B1 B1 M1 A1 A1	Condone consistent use of other variables or M3 for $3a + 2(52 - a) = 139$ or $3(52 - c) + 2c = 139$ o.e. Allow one numerical slip. If A0, SC1 for 17, 35

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9	(a) (i)	Similar	1	Allow enlargement
	(ii)	4.5	2	M1 for $\frac{AX}{3} = \frac{9}{6}$ oe
	(iii)	13.5 cao	2	M1 for $\left(\frac{3}{2}\right)^2$ or $\left(\frac{2}{3}\right)^2$ oe e.g. using base and height but other methods must be complete
	(iv)	$180 - x - y$ oe $180 - x$ oe	B1 B1	
	(b) (i)	96	1	
	(ii)	48 ft	1ft	ft 0.5 their (b)(i)
	(iii)	97 ft	1ft	ft 145 – their (b)(ii)
	(iv)	35	1	
	(c)	$20n = 360$ oe or $\frac{180(n-2)}{n} = 160$ oe or $180(n-2) = 8 \times 360$ oe or $8\left(\frac{360}{n}\right) = 180 - \frac{360}{n}$	M2	M1 for $9e = 180$ oe allow diagram to show this if reasonably clear or M1 for 8×360 or $\frac{8 \times 360}{n}$
		18 www 3	A1	
10	(a)	Pentagon Octagon 20	1 1, 1	
	(b)(i)	35	1	
	(ii)	54	1	
	(c)(i)	$p = 2, q = 3$	3	M1 for substituting a value of n e.g. $\frac{1}{p}4(4-q) = 2 \quad n \geq 3$ or M1 for number of diagonals from one vertex is $n - 3$ (allow in words) and B1 for one correct value. If 0, SC1 for $\frac{n}{2}(n-3)$ seen.
	(ii)	4850 ft	1ft	ft their (c)(i) allow only if ft calculates to a positive integer.
	(iii)	20 cao	2	SC1 for answer of 17 or M1 for their formula = 170
	(d)	31 cao	1	