

CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the November 2003 question papers**0580/0581 MATHEMATICS**

0580/01, 0581/01	Paper 1 (Core), maximum raw mark 56
0580/02, 0581/02	Paper 2 (Extended), maximum raw mark 70
0580/03, 0581/03	Paper 3 (Core), maximum raw mark 104
0580/04, 0581/04	Paper 4 (Extended), 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*.

- CIE will not enter into discussions or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the November 2003 question papers for most IGCSE and GCE Advanced Level syllabuses.



Grade thresholds taken for Syllabus 0580/0581 (Mathematics) in the November 2003 examination.

	maximum mark available	minimum mark required for grade:			
		A	C	E	F
Component 1	56	-	46	35	28
Component 2	70	51	28	16	-
Component 3	104	-	68	44	38
Component 4	130	101	59	36	-

The threshold (minimum mark) for B is set halfway between those for Grades A and C.
 The threshold (minimum mark) for D is set halfway between those for Grades C and E.
 The threshold (minimum mark) for G is set as many marks below the F threshold as the E threshold is above it.
 Grade A* does not exist at the level of an individual component.

Notes	Mark Scheme	Syllabus
	IGCSE EXAMINATIONS – NOVEMBER 2003	0580/0581

TYPES OF MARK

Most of the marks (those without prefixes, and 'B' marks) are given for accurate results, drawings or statements.

- **M** marks are given for a correct method.
- **B** marks are given for a correct statement or step.
- **A** marks are given for an accurate answer following a correct method.

ABBREVIATIONS

a.r.t.	Anything rounding to
b.o.d.	Benefit of the doubt has been given to the candidate
c.a.o.	Correct answer only (i.e. no 'follow through')
e.e.o.	Each error or omission
o.e.	Or equivalent
SC	Special case
s.o.i.	Seen or implied
ww	Without working
www	Without wrong working
√	Work followed through after an error: no further error made
⊥	Work followed through and another error found

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MARK SCHEME

MAXIMUM MARK: 56

SYLLABUS/COMPONENT: 0580/01, 0581/01

MATHEMATICS

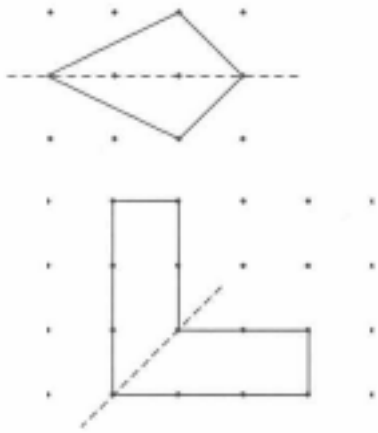
Paper 1 (Core)



Page 1	Mark Scheme	Syllabus	Paper
	IGCSE EXAMINATIONS – NOVEMBER 2003	0580/0581	1

Question Number	Mark Scheme Details			Part Mark
1		400 (grams)	1	1
2		(\$)2.7(0)	2	2
			M1 for $\frac{15}{100} \times 18$ o.e. SC1 for $\frac{85}{100} \times 18 = 15.3$	
3	(a)	$\frac{2}{5}$	1	2
	(b)	0	1	
			Accept equivalent fractions, decimals, percentages (with sign) accept $\frac{0}{5}, \frac{0}{k}$ do not accept, none, not but condone it with 0	
4	(a)	126°	1	3
	(b)	40(%)	2	
			M1 for $\frac{144}{360} \times 100$ o.e.	
5		1.71(01...)	2	2
			M1 for $5 \sin 20^\circ$ or $5 \cos 70^\circ$ or 1.7	
6		6 or $\frac{6}{1}$	2	2
			M1 for $\frac{60}{10}, \frac{1}{6}, \frac{1}{60}$	
7		144°	3	3
			M2 for $\frac{(2 \times 10 - 4) \times 90}{10}$ or $\frac{(10 - 2) \times 180}{10}$ or $180 - \frac{360}{10}$. After 0, SC1 for answer 36°	
8		$1250 \leq \text{r.l.} < 1350$	1 + 1	2
			SC1 if reversed	
9	(a)	$10x^2 - 15xy$	2	4
	(b)	$6x(x + 2)$	2	
			B1 for one term correct M1 for $6(x^2 + 2x)$ or $x(6x + 12)$ or $2(3x^2 + 6x)$ or $2x(3x + 6)$ or $3(2x^2 + 4x)$ or $3x(2x + 4)$	
10	(a)	87°	1	3
	(b)	28°	1	
	(c)	$62^\circ \sqrt{\quad}$	1	
			f.t. is $(90 - y)$	

Page 2	Mark Scheme	Syllabus	Paper
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11		1	Lines may be freehand but must go completely through the shape	3
		1		
		1		
12	$x = 4, y = 12$	3	M1 for attempting to eliminate one unknown by a correct method A1 for one correct value (x or y)	3
13	(a) (i) 2.4096...	1	f.t. from (i)	4
	(ii) 2.41 \checkmark	1		
	(b) 19.3 or 19.32(16...)	2	B1 for 2.68 seen or implied by 19.2...	
14	(a) Monday, Tuesday and Saturday	1	All three and no extras	4
	(b) -20	3	B1 for -14 seen + M1 for (their -14) \div 7	
15	(a) (i) 0.28	1		4
	(ii) 0.275	1		
	(iii) 0.2857... or 0.286	1		
	(b) $\frac{275}{1000}$, 28%, $\frac{2}{7}$ or equivalent \checkmark	1	f.t. from (a)	
16	(a) 4.58(m)	2	M1 for $\sqrt{5^2 - 2^2}$ s.o.i. e.g. $\sqrt{21}$	4
	(b) 66.40 or 66.30 – 66.450	2	M1 for $\cos^{-1} \frac{2}{5}$ o.e. incl $\sqrt{\quad}$	

Page 3	Mark Scheme	Syllabus	Paper
	IGCSE EXAMINATIONS – NOVEMBER 2003	0580/0581	1

17	(a)	3	1	10 ⁸ etc. penalise once only	4	
	(b)	-4	1	accept -04		
	(c)	0	1			
	(d)	-2	1			
18	(a)	0.4 or 2.6	2	B1 for one correct SC1 if (0.4,0) (2.6,0)	6	
	(b)	(i)	0	1		Must be ruled
		(ii)	Correct line from $x = -1$ to $x = 4$	1		
(c)	(0,1), (4,5) ✓	2	B1 for one correct f.t. from (b) (ii)			

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MARK SCHEME

MAXIMUM MARK: 70

SYLLABUS/COMPONENT: 0580/02, 0581/02

MATHEMATICS

Paper 2 (Extended)



Page 1	Mark Scheme	Syllabus	Paper
	IGCSE EXAMINATIONS – NOVEMBER 2003	0580/0581	2

* indicates that it is necessary to look in the working following a wrong answer

1	0.5 or $\frac{1}{2}$ c.a.o.	1	
2	(-)4504	1	Allow (-)4500
3	(a) 121 (b) $(n + 1)^2$	1 1	Allow 49, 64, 81, 100, 121 $n^2 + 2n + 1$
4	3/2500, 1/8, 0.00126	2*	M1 for all 3 evaluated as decimals (or fractions or percentages or stand. form) SC1 reversed order
5	(a) -1, $\sqrt{36}$ (b) $\sqrt{2}$, $\sqrt{30}$	1 1	Allow -1, ± 6 SC1 (a) -1 and (b) $\sqrt{36}$, $\sqrt{2}$, $\sqrt{30}$
6	$l = mr/5$	2*	M1 for $\frac{240 \times r \times m}{100 (\times 12)}$ o.e.
7	66.7	2	M1 for $\frac{2.4}{3.6} \times 100$ o.e.
8	(a) -1 (b) 5k	1 1	
9	(a) 32000 (b) <u>25450</u> <u>25550</u>	1 1, 1	SC1 both correct and reversed
10	11.5(2)	3*	M1 $F = kv^2$ M1 $k = 18/40^2$ or better
11	(a) 3110 (b) 322	2* 1 \checkmark	M1 for $1936 \div 0.623$ or 1936×1.61 Allow 3107.54, 3107.5, 3108 or 3107.3 SC1 3107 $1000000 \div$ (a)
12	(a) 45, 225 (b) 157.5	1, 1 1	Allow 158
13	(a) 5.5 or $5\frac{1}{2}$ (b) 21.5	1 2*	M1 $172 \div 8$
14	(a) $\frac{x+3}{x(x+1)}$ (b) -3	3* 1 \checkmark	M1 $3(x+1) - 2x$ M1 denominator $x(x+1)$

Page 2	Mark Scheme	Syllabus	Paper
	IGCSE EXAMINATIONS – NOVEMBER 2003	0580/0581	2

15	(a) angle bisector of angle P	2*	M1 correct construction method A1 $\pm 1^\circ$ SC1 for accurate line but no arcs M1 radius drawn, meets (a) and O labelled. A1 $\pm 1^\circ$
	(b) radius from T or U	2*	
16	(a) A(2,0) B(0,-6)	1, 1	SC1 correct and reversed M1 $(AB^2) = "(0 - 2)^2 + (-6 - 0)^2"$ from (a)
	(b) 6.32	2*	
	(c) (1,-3)	1 \checkmark	
17	(a) 20	1	(b) – (c)
	(b) 98	1	
	(c) 62	1	
	(d) 124	1	
	(e) 36	1 \checkmark	
18	(a) 5.8×10^8	1	M1 figs 58 \div figs 59 or figs 9830508 M1 figs 59 \div figs 58×10^n or $\frac{1}{(b)} \times 10^n$ $n = 3$ or 6
	(b) 98	2*	
	(c) 10200	2*	
19	(a) -6	2	M1 $1 - 2(7/2)$ M1 $\frac{5x}{2}$ o.e., $2 - 4x = x$ or better
	(b) (i) 0.4	2	
	(ii) (0.4, 0.2)	1	
20	(a) (i) $-\frac{2}{3}p + q$	2*	M1 use of AQ = $\pm \frac{2}{3}p \pm q$ or AO + OQ M1 use of BQ = $\pm \frac{3}{4}q \pm p$ or BO + OP
	(ii) $-\frac{3}{4}q + p$	2*	
	(b) $\frac{1}{3}p - \frac{1}{2}q$	2*	
21	(a) $60x + 80y \leq 1200$ seen	1	Allow $0.6x + 0.8y \leq 12$ M1 intention A1 accurate Dep. on both lines Allow 20, 0 or $20 + 0$
	(b) $x \geq y$	1	
	(c) line $y = x$	1	
	line through (20,0) and (0,15)	2*	
	shading out or R labelled	1	
(d) 20 c.a.o.	1		
Total 70			

TOTAL MARKS 70

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MARK SCHEME

MAXIMUM MARK: 104

SYLLABUS/COMPONENT: 0580/03, 0581/03

MATHEMATICS

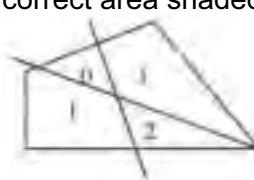
Paper 3 (Core)



Page 1	Mark Scheme	Syllabus	Paper
	MATHEMATICS – NOVEMBER 2003	0580/0581	3

Question Number	Mark Scheme	Part Marks	Notes	Question Total
1 a)	24	1		
b)	25 or 5^2	1		
c)	27 or 3^3	1		
d)	23	1		
	29	1		
e)	26	1	condone 6, 26 or 6×26	
f)	28 cao	1		
g)	21 and 27	1	condone 21×27	8
2 a) i)	1300 or 1 pm	1		
ii)	1030	1	allow 10.30, 10:30 etc	
iii)	9	2	B1 for either 24 or 33 seen or M1 for 2 correct horizontal lines drawn or 24 and 33 marked on axis	
b) i)	4.35, 8.7(0)	2	B1 for one correct	
ii)	Correct straight line (through (10, 8.6 to 8.8))	2	P1 for (5, 4.2 to 4.4) or (10, 8.6 to 8.8)	
iii)	9.2(0) (± 0.1)	1	no ft.	
iv)	575 (± 5)	1	no ft.	10
				18
3 a)	6000	2	M1 for $25 \times 30 \times 8$	
b) i)	art 4400	3	M2 for $\pi \times 10^2 \times 14$ or SC1 for $\pi \times 5^2 \times 14$	
ii)	art 10400	1 \checkmark	ft <i>their a + bi</i>	
iii)	art 13.9	3 \checkmark	ft for (<i>their bii</i>) $\div (25 \times 30)$ M2 for (<i>their bii</i>) $\div (25 \times 30)$ oe or M1 for (<i>their bi</i>) $\div (25 \times 30)$	9
4 a)	4, 7, 6, 4, 4, 2, 3	2	SC1 for 5 or 6 correct or 7 correct tallies	
b)	1 cao	1		
c)	2 cao	2	M1 for attempt at ranking list seen	
d)	2.5 cao	2	M1 <i>their</i> $\sum f(x) \div \sum f$ imp by 2.5 seen	
e) i)	0.23(3....) or $\frac{7}{30}$	1 \checkmark	allow 23% ft from their table	
ii)	0.3 or $\frac{3}{10}$ or $\frac{9}{30}$	1 \checkmark	ft from their table	
f)	40	1 \checkmark	ft <i>their</i> table $\times 10$. Allow 40/300	10
				19
5 a)	6 -4	1 1		
b) i)	Rotation through 180° about (2.5, 6) o.e.	M1 A1 A1	Half turn M1 AI , -1 for "symmetry" allow correct description of point	
ii)	Enlargement s.f. 3 centre (1,7)	B1 B1 B1	accept scale 3, x3 etc accept 'B' for (1,7)	
c) i)	3 cao	1	ignore units	
ii)	1 : 9 cao	2	SC1 for 27 seen M1 for correct answer nlt	
d)	$\frac{-2}{3}, \frac{-6}{9}, -0.66$ or better	2	SC1 for $\frac{2}{3}$ oe or -k	13

Page 2	Mark Scheme	Syllabus	Paper
	MATHEMATICS – NOVEMBER 2003	0580/0581	3

6 a) i)	27	1		
ii)	6	2	M1 for $(39 - 3) \div 6$	
iii)	$\frac{P-3}{6}$ oe	2	M1 for P-3 seen or $\frac{P}{6} = \frac{6x+3}{6}$ oe seen	
b) i)	$4x + 3$		M1 for $9x + 4 - 2x - (3x + 1)$ oe allow $9x + 4 - 2x - 3x + 1$ oe for M1 or SC1 for $4x$ or $(+)3$ in answer space	
ii)	10, 16 and 23	3	M1 for $9x + 4 = 49$ oe A1 for $x = 5$	10
				23
7 a) i)	44	2	SC1 for 40 to 48	
ii)	52	3	B1 for 6 or 8 or 12 or 9 or 21 or 28 or 32 or 112 seen +M1 for adding 6 rectangles o.e.	
iii)	cuboid or rectangular prism	1	allow rectangular cuboid but not cube or cubical	
iv)	52	1 \checkmark	ft from <i>their aii</i> (not strict ft)	
v)	24	2	M1 for $2 \times 3 \times 4$	
b) i)	$2(pq + qr + pr)$ oe as final answer	2	SC1 for pq or qr or pr seen or imp. for both parts. Other letters used consistently MR-1	
ii)	pqr as final answer	2	M1 for pqr seen	13
8 a)	12.5 NB 4021 answer 12.5 working uses 75 and 800	3	M1 for 7.5×12 oe or $80/12$ oe seen +M1 for $\frac{90-80}{80} \times 100$ (explicit) or $\frac{7.50 - 6.66\dots}{6.66\dots} \times 100$ (explicit) after M0 SC2 for <i>figs</i> 124 to 126 ww or SC1 for 112.5	
b)	120 minutes	3	B1 for $\frac{2}{5}$ or 180 or $\frac{3}{5} \times 300$ seen +M1 for $\frac{2}{5} \times 300$ oe or $300-180$	
c) i)	Accurate \perp bisector of AB, with arcs $\pm 1^\circ \pm 1\text{mm}$ complete inside figure Accurate bisector of $\angle C$ with arcs as above	2 2	SC1 if accurate without arcs <u>or</u> incomplete line. Ignore extra lines SC1 if accurate without arcs <u>or</u> incomplete line as above	
ii)	correct area shaded 	2 \checkmark	Areas marked as diagram ft from clear intention to draw perp. bisector and angle bisector	12
9 a) i)	150 (km)	1		
ii)	15 000 000 oe (\checkmark)	2	M1 for <i>their a)i</i>) $\times 100 \times 1000$ or SC1 for <i>their a)i</i>) $\times 10^n$ when $n > 0$	
b) i)	1270 to 1320	2	M1 for <i>their</i> $8.6 \times \text{their } 150$ must have some evidence for <i>their</i> 8.6	
ii)	(0)45 to (0)48 oe	1		
iii)	245 to 248	2	SC1 for any answer in the range $180 < x < 270$	8
				20

Page 3	Mark Scheme	Syllabus	Paper
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10 a)	1 6 15 20 15 6 1 Sum 64 1 7 21 35 35 21 7 1 Sum 128	1 1 2 1	SC1 if 6 or 7 correct	
b) i)	512 accept 2^9	2	SC1 for 256	
ii)	2^n	2	SC1 for 2 x 2 x 2 seen or description	
c)	165 330 462 The first 6 numbers repeated in reverse order	1 1		11
				11
			TOTAL	104

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MARK SCHEME

MAXIMUM MARK: 130

SYLLABUS/COMPONENT: 0580/04, 0581/04

MATHEMATICS

Paper 4 (Extended)




Page 1	Mark Scheme	Syllabus	Paper
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Marks in brackets are totals for questions or part questions.

1	(a)	144:96 <u>Final</u> answer 3:2 or 1.5:1 or 1:0.667	B1 B1 (2)	After B0 , allow SC1 for reversed "correct" final ans. www2
	(b)	(i) 32 (children) (ii) 54 (adults off) (iii) 110 (adults on) (iv) 26 (=x) w.w.w.	B1 B1 B1 B1 (4)	
	(c)	$300 \times \frac{4}{thier(6+5+4)}$ 80 children	M1 A1 (2)	www2
	(d)	(i) <u>Final Ans.</u> 21 13 or (0)9 13 pm (ii) 7 h 20 min (o.e) $\times \frac{10}{110}$ (or $\times \frac{100}{110}$) 40 min	B1 M1 A1 (3) (11)	Condone hrs but hrs and <u>minutes</u> \Rightarrow BO Implied by 6 h 40 min or 400 min www2
2	(a)	(i) 1.8(02..)	B1	Throughout (a)(i)(ii)(iii) <u>NO</u> misreads allowed.
		(ii) $1.99^2 = \frac{80h}{3600}$ o.e. (h =) 178(.2)	M1 A1	Must be <i>h</i> , not \sqrt{h} ww2 (<u>Must</u> be correct – e.g. 178.4 \Rightarrow MO ww)
		(iii) $A^2 = \frac{hm}{3600}$ $3600A^2 = hm$ $\frac{3600A^2}{m} = h$	M1 M1 M1 (6)	(First step must be correct from correct formula for <u>first</u> M1 .) Correctly squares at any stage Correctly multiplies at any stage Correctly divides at any stage Only a correct answer in this form can get M3 .
	(b)	(i) $(x+4)(x-4)$ (ii) $x(x-16)$ (iii) $(x-8)(x-1)$	B1 B1 B2 (4)	i.s.w. solutions in all (b) Condone loss of final bracket in any (b)

Page 2	Mark Scheme	Syllabus	Paper
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(c) (i)	$x(3x - 9) = 2x^2 - 8$ o.e. $2x^2 - 8 = 3x^2 - 9x$ $x^2 - 9x + 8 = 0$	M1	No error seen and some working to reach final quoted equation. Must have = 0. (E = established)
(ii)	$x = 1$ $x = 8$	B1 B1	
(iii)	time = 15 (sec) c.a.o. distance = 120 (m) c.a.o.	B1 B1	
		(6)	
		(16)	
3 (a) (i)	$17^2 + 32^2 - 2.17.32 \cos 40^\circ$ $\sqrt{\text{their } 479.54}$ Answer in range 21.89 to 21.91 (m)	M2 M1 A1	Allow M1 for sign error or correct implicit eqn Dep M2. <u>NOT</u> for $\sqrt{225 \cos 40^\circ}$ or $\sqrt{2146}$ www4
(ii)	$\frac{\sin T}{17} = \frac{\sin 40^\circ}{\text{their } 21.9}$ $\sin T = \frac{17 \sin 40^\circ}{\text{their } 21.9}$ (0.499) 29.9°	M1 M1 A1	or $17^2 = 32^2 + (\text{their } 21.9)^2 - 2.32. (\text{their } 21.9) \cos T$ $\cos T = \frac{32^2 + (\text{their } 21.9)^2 - 17^2}{2.32. (\text{their } 21.9)}$ Accept 29.93° to 29.94° . www3
(b) (i)	125° c.a.o.	B1	<u>All</u> bearings must be $0^\circ \leq \theta \leq 360^\circ$ to score
** (ii)	305°	B1√	$\sqrt{(180^\circ + \text{their } 125^\circ)}$ correct
** (iii)	335° or 334.9°	B1√	$\sqrt{(\text{their } 305^\circ + \text{their } T)}$ correct
		(3)	
(c)	$\tan(\hat{F}) = \frac{30}{32}$ o.e.  43.2°	M1 A1	or $F\hat{X}T = \tan^{-1} \frac{30}{32}$ <u>clearly</u> identified. ° (43.15239°) www2 <u>NOT</u> 43.1
		(2)	
		(12)	
4 (a)	Scale correct 8 correct plots (0, 0), (1, 25), (2, 37.5), (3, 43.8), (4, 46.9), (5, 48.4), (6, 49.2), (7, 49.6) Reasonable curve through 8 points	S1 P3 C1	$0 \leq t \leq 7$ (14 cm) and $0 - 60 \uparrow$ (12 cm) Allow P2 for 6 or 7 correct P1 for 4 or 5 correct Accuracy better than 2mm horizontally. In correct square \uparrow Not for linear or <u>bad</u> quality
		(5)	

Page 3	Mark Scheme	Syllabus	Paper
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(b) (i)	$f(8) = 49.8$ or $49\frac{103}{128}$ o.e.	B1	Do not accept improper fractions
	$f(9) = 49.9$ or $49\frac{231}{256}$ o.e.	B1	
(ii)	$f(t \text{ large}) \approx 50$	B1	
(c) (i)	Tangent drawn at $t = 2$ Uses vert/horiz using scale	B1 M1	Not a chord and not daylight Can be given after B0 if line not too far out
**	Answer correct for their tangent	A1 ✓	
(ii)	Acceleration or units	B1 (4)	Accept ms^{-2} , m/s^2 , m/s/s .
(d) (i)	Straight line through (0, 10) Straight line gradient 6	B1 B1	} Must be ruled and full length to earn B2
**	(ii) one $\sqrt{\quad}$ intersection value for t	B1 ✓	
**	Second \sqrt{t} <u>and</u> range	B1 ✓	
(iii)	Distance = area (under curve) First particle ($f(t)$) goes further	M1 A1 (6)	
		(18)	
<u>Marking final answers throughout this question</u>			
5 (a) (i)	0.2 o.e.	B1	Accept 2/10, 1/5, 20%
(ii)	0.4 o.e.	B1	After first B0 , condone "2 in 10" type answers.
(iii)	0.5 o.e.	B1	Never condone 2 : 10 type
(iv)	0.1 o.e.	B1	
(v)	0	B1 (5)	Accept "none", "nothing", 0/10, nil, zero
(b) (i)	$2/10 \times 1/9$ $1/45$ o.e.	M1 A1	Accept 2/90, 0.0222 2.22% www2
(ii)	$3/10 \times 2/9$ $1/15$ o.e.	M1 A1	Accept 6/90 etc, 0.0666(or 7), 6.66 or 6.67% www2
(iii)	(their) $1/45 +$ (their) $1/15$ $4/45$ o.e.	M1 A1	Accept 8/90 etc, 0.0888(or 9), 8.88 or 8.89% www2
(iv)	<u>Clearly</u> $1 -$ (their) 4.45 o.e. $41/45$	M1 A1 (8)	Alternative method must be complete Accept 82/90 etc, 0.911, 91.1% www2
		(13)	

Page 4	Mark Scheme	Syllabus	Paper
	IGCSE EXAMINATIONS – NOVEMBER 2003	0580/0581	4

6	(a)	$\pi(30)^2$ (50) 141 000 (cm ³)	M1 A1 (2)	(141 300 to 141 430)	www2
	(b) (i)	18 (cm)	B1		
	(ii)	$\cos\left(\frac{1}{2}\angle AOB\right) = (\text{their } 18)/30$ x2 $\angle AOB = 106.26^\circ$ c.a.o	M1 M1dep A1 (4)	Allow M1 or M2 at similar stages for other methods e.g. $\sin A = 18/30$ then $(180^\circ - 2A)$ Must have 2 decimal places seen. ww1 (condone = 106.3 afterwards)	
	(c) (i)	(their) $\frac{106.3}{360}$ used $\pi(30)^2$ used 834 to 835.3 (cm ²)	M1 M1 A1	www3	
	(ii)	$\frac{1}{2} \cdot 30 \cdot 30 \sin$ (their) 106.3° or $\frac{1}{2} \cdot 48.18$ 431.8 to 432 (cm ²)	M1 A1	www2	
	(iii)	Ans. Rounds to 403 cm ²	A1 (6)		
	(d) (i)	50 x (their) 403	M1		
	**	20 100 to 20 200 (cm ³)	A1√	√ correct for their "403"	www2
	** (ii)	20.1 to 20.2 (litres)	B1√ (3)	√ their previous answer ÷ 1000	
	(e)	$k\left[\frac{1}{2}\text{their (a)} - \text{their (d) (i)}\right]$ 50.3 to 51 (litres)	M1 A1 (2) (17)	$k = 1$ (cm ³) $k = .001$ (litres) $k = \text{other} \Rightarrow$ consistent conversion error. Marking final answer	www2
7	(a) (i)	$F \begin{pmatrix} 2 \\ -4 \end{pmatrix}$	M1 A1	M marks for letters, A marks for descriptions. If <u>no</u> letter given, allow SC1 for correct description	
	(ii)	D x = 1	M1 A1		
	(iii)	E (2, -1)	M1 A1		
	(iv)	C (s.f.) 3	M1 A1		
	(v)	A Shear	M1 A1 (10)		

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(b)	$(-1 \ -2) \begin{pmatrix} 1 & 3 \\ 5 & 7 \end{pmatrix}$ or QP $(-11 \ -17)$ <u>final</u> ans $(1 \ 2 \ 3) \begin{pmatrix} -1 \\ 2 \\ 3 \end{pmatrix}$ or RS (12)	M1 A2 M1 A2 (6) (16)	Penalty -1 for <u>each</u> wrong one thought possible. Allow SC1 for one correct Brackets essential here. Allow SC1 for 12 or $-1 + 4 + 9$
8 (a) (i)	$10 < M \leq 15$ (ii) Midpoints $5, 12.5, 17.5, 22.5, 32.5$ $\sum fx$ ($60 + 400 + 490 + 540 + 780$) (their) $2270 \div 120$ 18.9 (2) (kg) (1) (iii) 36°	B1 M1 M1 M1 A1 B1 (6)	Must clearly mean this and not 32 Allow for 3 or 4 correct (2270) Needs previous M1 or only marginally out dep previous M1 www4
(b)	Horizontal scale $2 \text{ cm} \equiv 5 \text{ units}$ (numbered or used correctly) Heights $3k, 16k, 14k, 12k, 4k \text{ cm}$ Their $k = 1$	S1 B5 B1 (7) (13)	$0 \leq M \leq 40$. Accuracy $< 2 \text{ mm}$. If S0 (e.g. $1 \text{ cm} \equiv 5 \text{ units}$) can score B5 If S0 (e.g. $0, 10, 15$) can only score on correct width bars. Penalty -1 for polygon superimposed. If not scored, decide on their "k" and allow SC1 for each "correct" bar. (Needs ≥ 2 bars to decide on value of k if $k \neq 1$.)
9 (a) (i)	(Diagram) 5 only	B1	
(ii)	(Diagram) 4 only	B1	
(iii)	(Diagram) 2 only	B1	
		(3)	

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(b)	Diagram 1 9 (cm ²)	B1	9.00 to 3 s.f.
	Diagrams 2 and 3 have same area	B1	
	One of them $\frac{1}{2} \times 3 \times 3$	M1	
	$4\frac{1}{2}$ (cm ²)	A1	www2
	Diagram 4 $\frac{1}{4} \pi 3^2$ s.o.i.	M1	(7.07 cm ²)
	$\frac{1}{2} \times 6 \times 6$ – their $9\pi/4$	M1	indep. i.e. $18 - k\pi$ where k numerical
	10.9 (cm ²)	A1	www3
	Diagram 5 $22\frac{1}{2}^\circ$ s.o.i.	M1	 (bc = $\sqrt{72}$)
	$6 \tan 22\frac{1}{2}^\circ$	M1	(2.485) (This is AD <u>or</u> DE)
	$\frac{1}{2} (6 - \text{their } 2.485) \times 6$	dep.M1	or $18 - \frac{1}{2} \times 6 \times \text{their } 2.485$. (o.e.)
	10.5 (cm ²)	A1	www4
		(11)	
		(14)	