CAMBRIDGE
INTERNATIONAL EXAMINATIONS

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.

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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.

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
$\surd$	Work followed through after an error: no further error made
$\frac{\surd}{\surd}$	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)

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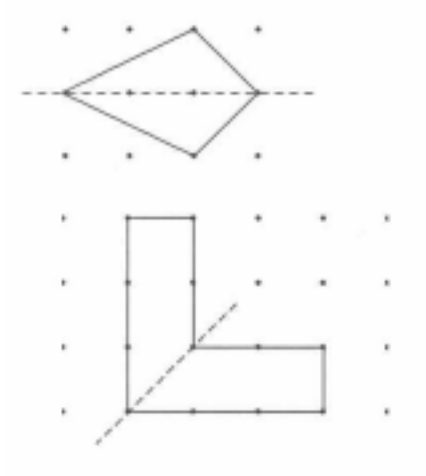
Question Number		Mark Scheme Details			Part Mark
1		400 (grams)	1		1
2		($)2.7(0)	2	**M1** for $\frac{15}{100}\times 18$ o.e. **SC1** for $\frac{85}{100}\times 18 = 15.3$	2
3	(a)	$\frac{2}{5}$	1	Accept equivalent fractions, decimals, percentages (with sign)	2
	(b)	0	1	accept $\frac{0}{5}, \frac{0}{k}$ 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	**M1** for 5 sin 20° or 5 cos70° or 1.7	2
6		6 or $\frac{6}{1}$	2	**M1** for $\frac{60}{10}$, $\frac{1}{\frac{1}{6}}, \frac{1}{\frac{10}{60}}$	2
7		144°	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°	3
8		1250 ≤ r.l. < 1350	1 + 1	**SC1** if reversed	2
9	(a)	$10x^2 - 15xy$	2	**B1** for one term correct	4
	(b)	6x (x + 2)	2	**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° √	1	f.t. is (90 – y)	

11		 Any line through the centre	1 1 1	Lines may be freehand but must go completely through the shape	**3**
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… (ii) 2.41 √	1 1	f.t. from (i)	**4**
	(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)	-2o	3	**B1** for –14 seen + **M1** for (their –14) ÷ 7	
15	**(a)**	(i) 0.28 (ii) 0.275 (iii) 0.2857… or 0.286	1 1 1		**4**
	(b)	$\frac{275}{1000}$, 28%, $\frac{2}{7}$ or equivalent √	1	f.t. from **(a)**	
16	**(a)**	4.58(m)	2	**M1** for $\sqrt{5^2 - 2^2}$ s.o.i. e.g. √21	**4**
	(b)	66.4o or 66.3o – 66.45o	2	**M1** for $\cos^{-1}\frac{2}{5}$ o.e. incl √	

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 (ii) Correct line from x = -1 to x = 4	1 1	 Must be ruled	
	(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)

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* 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)** 2545<u>0</u> 2555<u>0</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 √	**M1** for 1936 ÷ 0.623 or 1936 x 1.61 Allow 3107.54, 3107.5, 3108 or 3107.3 **SC1** 3107 1000000 ÷ **(a)**
12	**(a)** 45, 225 **(b)** 157.5	1, 1 1	Allow 158
13	**(a)** 5.5 or 5½ **(b)** 21.5	1 2*	**M1** 172 ÷ 8
14	**(a)** $\frac{x+3}{x(x+1)}$ **(b)** -3	3* 1 √	**M1** $3(x + 1) - 2x$ **M1** denominator $x(x + 1)$

15	**(a)** angle bisector of angle P **(b)** radius from T or U	2* 2*	**M1** correct construction method **A1** $\pm 1^o$ **SC1** for accurate line but no arcs **M1** radius drawn, meets **(a)** and O labelled. **A1** $\pm 1^o$
16	**(a)** A(2,0) B(0,-6) **(b)** 6.32 **(c)** (1,-3)	1, 1 2* 1 √	**SC1** correct and reversed **M1** (AB^2) = "(0 –2)"^{2} + "(-6 -0)"^{2} from **(a)**
17	**(a)** 20 **(b)** 98 **(c)** 62 **(d)** 124 **(e)** 36	1 1 1 1 1 √	**(b)** – **(c)**
18	**(a)** 5.8×10^8 **(b)** 98 **(c)** 10200	1 2* 2*	**M1** figs 58 ÷ figs 59 or figs 9830508 **M1** figs 59 ÷ figs 58 x 10^n or $\frac{1}{\textbf{(b)}} \times 10^n$ n = 3 or 6
19	**(a)** -6 **(b)** **(i)** 0.4 **(ii)** (0.4, 0.2)	2 2 1	**M1** 1 – 2(7/2) **M1** $\frac{5x}{2}$ o.e., 2 - 4x = x or better
20	**(a)** **(i)** $-{}^2/_3\mathbf{p} + \mathbf{q}$ **(ii)** $-{}^3/_4\mathbf{q} + \mathbf{p}$ **(b)** $^1/_3\mathbf{p} - {}^1/_2\mathbf{q}$	2* 2* 2*	**M1** use of **AQ** = $\pm {}^2/_3\mathbf{p} \pm \mathbf{q}$ or **AO** + **OQ** **M1** use of **BQ** = $\pm {}^3/_4\mathbf{q} \pm \mathbf{p}$ or **BO** + **OP** **M1** $-{}^1/_4\mathbf{q} + {}^1/_3\mathbf{BP}$
21	**(a)** $60x + 80y \leq 1200$ seen **(b)** $x \geq y$ **(c)** line y = x line through (20,0) and (0,15) shading out or R labelled **(d)** 20 c.a.o.	1 1 1 2* 1 1	Allow $0.6x + 0.8y \leq 12$ **M1** intention **A1** accurate Dep. on both lines Allow 20, 0 or 20 + 0
Total 70			

TOTAL MARKS 70

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MARK SCHEME

MAXIMUM MARK: 104

SYLLABUS/COMPONENT: 0580/03, 0581/03

MATHEMATICS

Paper 3 (Core)

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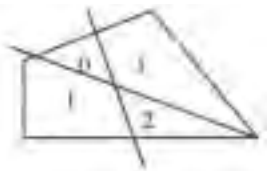
Question Number	Mark Scheme	Part Marks	Notes	Question Total
1 a)	24	1		
b)	25 or 5^2	1		
c)	27 or 3^3	1		
d)	23 29	1 1		
e)	26	1	condone 6, 26 or 6 x 26	
f)	28 cao	1		
g)	21 and 27	1	condone 21 x 27	**8**
2 a) i)	1300 or 1 pm	1		
ii)	1030	1	allow 10.30, 10:30 etc	
iii)	9	2	**B1** for either 24 or 33 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 x 30 x 8	
b) i)	art 4400	3	**M2** for π x 10^2 x 14 or **SC1** for π x 5^2 x 14	
ii)	art 10400	1 √	ft *their a* + *bi*	
iii)	art 13.9	3 √	ft for (*their bii*) ÷ (25 x 30) **M2** for (*their bii*) ÷ (25 x 30) oe or **M1** for (*their bi*) ÷ (25 x 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** *their* $\sum f(x) \div \sum f$ imp by 2.5 seen	
e) i)	0.23(3....) or $\frac{7}{30}$	1 √	allow 23% ft from their table	
ii)	0.3 or $\frac{3}{10}$ or $\frac{9}{30}$	1 √	ft from their table	
f)	40	1 √	ft *their* table x 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 Al**, –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**

6 a) i)	27	1		
ii)	6	2	**M1** for (39 - 3) ÷ 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 √	ft from *their aii* (not strict ft)	
v)	24	2	**M1** for 2 x 3 x 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 x 12 oe or 80/12 oe seen +**M1** for $\frac{90-80}{80}x100$ (explicit) or $\frac{7.50-6.66....}{6.66....}x100$ (explicit) after M0 **SC2** for *figs* 124 to 126 ww or **SC1** for 112.5	
b)	120 minutes	3	**B1** for $\frac{2}{5}$ or 180 or $\frac{3}{5}$ x 300 seen +**M1** for $\frac{2}{5}$ x 300 oe or 300-180	
c) i)	Accurate ⊥ bisector of AB, with arcs ±1°±1mm complete inside figure	2	**SC1** if accurate without arcs or incomplete line. Ignore extra lines	
	Accurate bisector of <C with arcs *as above*	2	**SC1** if accurate without arcs or incomplete line *as above*	
ii)	correct area shaded 	2 √	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 (√)	2	**MI** for *their* a)i) x 100 x 1000 or **SC1** for *their* a)i) x 10^n when n>0	
b) i)	1270 to 1320	2	**M1** for *their* 8.6 x *their* 150 must have some evidence for *their* 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

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)

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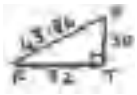
Marks in brackets are totals for questions or part questions.

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

	(c)	(i)	$x(3x - 9) = 2x^2 - 8$ o.e.		M1	
			$2x^2 - 8 = 3x^2 - 9x$			No error seen and some working to reach final quoted equation. Must have = 0. (E = established)
			$x^2 - 9x + 8 = 0$		E1	
		(ii)	$x = 1$		B1	
			$x = 8$		B1	
		(iii)	time = 15 (sec)	c.a.o.	B1	
			distance = 120 (m)	c.a.o.	B1	
					(6)	
					(16)	
3	(a)	(i)	$17^2 + 32^2 - 2.17.32 \cos 40°$		M2	Allow **M1** for sign error or correct implicit eqn
			√their 479.54		M1	Dep M2. NOT for $\sqrt{225\cos 40^\circ}$ or $\sqrt{2146}$
			Answer in range 21.89 to 21.91 (m)		A1	www4
		(ii)	$\frac{\sin T}{17} = \frac{\sin 40^\circ}{\text{their } 21.9}$		M1	or $17^2 = 32^2 + (\text{their } 21.9)^2 - 2.32.(\text{their } 21.9)\cos T$
			$\sin T = \frac{17 \sin 40^\circ}{\text{their } 21.9}$	(0.499)	M1	$\cos T = \frac{32^2 + (\text{their } 21.9)^2 - 17^2}{2.32.(\text{their } 21.9)}$
			29.9°		A1	Accept 29.93° to 29.94°. www3
					(7)	
	(b)	(i)	125° c.a.o.		B1	All bearings must be $0° \leqslant \theta \leqslant 360°$ to score
	**	(ii)	305°		B1√	√ (180° + their 125°) correct
	**	(iii)	335° or 334.9°		B1√	√ (their 305° + their *T*) correct
					(3)	
	(c)		$\tan(\hat{F}) = \frac{30}{32}$ o.e.		M1	or $F\hat{X}T = \tan^{-1}\frac{32}{30}$ clearly identified. °
			43.2°		A1	(43.15239°) www2 NOT 43.1
					(2)	
					(12)	
4	(a)		Scale correct		S1	$0 \leqslant t \leqslant 7$ (14 cm) and 0 – 60 ↑ (12 cm)
			8 correct plots (0 , 0), (1 , 25),			Allow **P2** for 6 or 7 correct
			(2 , 37.5), (3 , 43.8), (4 , 46.9),		P3	**P1** for 4 or 5 correct
			(5 , 48.4), (6 , 49.2), (7 , 49.6)			Accuracy better than 2mm horizontally. In correct square ↑
			Reasonable curve through 8 points		C1	Not for linear or bad quality
					(5)	

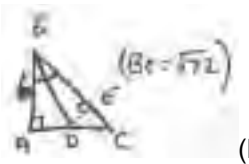
(b)	(i)	f(8) = 49.8 or $49\frac{103}{128}$ o.e.	B1		Do not accept improper fractions
		f(9) = 49.9 or $49\frac{231}{256}$ o.e.	B1		
	(ii)	f(t large) ≈ 50	B1		
			(3)		
(c)	(i)	Tangent drawn at t = 2	B1		Not a chord and not daylight
		Uses vert/horiz using scale	M1		Can be given after **B0** if line not too far out
**		Answer correct for their tangent	A1 √		
	(ii)	Acceleration or units	B1		Accept ms^{-2}, m/s^2, m/s/s.
			(4)		
(d)	(i)	Straight line through (0 , 10)	B1	}	Must be ruled and full length to earn B2
		Straight line gradient 6	B1	}	
**	(ii)	one √ intersection value for t	B1√		
**		Second √ t and range	B1√		
	(iii)	Distance = area (under curve)	M1		
		First particle (f(t)) goes further	A1		
			(6)		
			(18)		

Marking final answers throughout this question

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	Accept "none", "nothing", 0/10, nil, zero
					(5)	
	(b)	(i)	2/10 x 1/9		M1	
			1/45	o.e.	A1	Accept 2/90, 0.0222 2.22% www2
		(ii)	3/10 x 2/9		M1	
			1/15	o.e.	A1	Accept 6/90 etc, 0.0666(or 7), 6.66 or 6.67% www2
		(iii)	(their) 1/45 + (their) 1/15		M1	
			4/45	o.e.	A1	Accept 8/90 etc, 0.0888(or 9), 8.88 or 8.89% www2
		(iv)	Clearly 1 – (their) 4.45	o.e.	M1	Alternative method must be complete
			41/45		A1	Accept 82/90 etc, 0.911, 91.1% www2
					(8)	
					(13)	

6	(a)		$\pi(30)^2$ (50)	M1		
			141 000 (cm^3)	A1	(141 300 to 141 430)	www2
				(2)		
	(b)	(i)	18 (cm)	B1		
		(ii)	$\cos\left(\frac{1}{2}\angle AOB\right)$ = (their 18)/30	M1	Allow M1 or M2 at similar stages for other methods e.g. sin A = 18/30 then (180° – 2A)	
			x2	M1dep		
			$\angle AOB$ = 106.26° c.a.o	A1	Must have 2 decimal places seen. ww1 (condone = 106.3 afterwards)	
				(4)		
	(c)	(i)	(their) $\frac{106.3}{360}$ used	M1		
			$\pi(30)^2$ used	M1		
			834 to 835.3 (cm^2)	A1	www3	
		(ii)	$\frac{1}{2}$.30.30sin (their) 106.3° or $\frac{1}{2}$.48.18	M1		
			431.8 to 432 (cm^2)	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√	√ their previous answer ÷ 1000	
				(3)		
	(e)		$k\left[\frac{1}{2}\text{their (a)} - \text{their (d) (i)}\right]$	M1	k = 1 (cm^3) k = .001 (litres) k = other ⇒ consistent conversion error.	
			50.3 to 51 (litres)	A1	Marking final answer	www2
				(2)		
				(17)		
7	(a)	(i)	F $\begin{pmatrix} 2 \\ -4 \end{pmatrix}$	M1 A1	M marks for letters, A marks for descriptions. If no 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)		

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

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