Cambridge Assessment

GCSE

Mathematics

Session: 1994 June
Type: Mark scheme
Code: 1660

MEG

MIDLAND EXAMINING GROUP

GCSE EXAMINATIONS SUMMER 1994

MARKING SCHEME

for

MATHEMATICS (without coursework) PAPER 1 (1660/1)

Notes:

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GCSE MATHEMATICS - SYLLABUS 1660/1661

GENERAL INSTRUCTIONS

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4. Types of Marks
   - M (method) marks are not lost for purely numerical errors.
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   The meaning of other labels, such as P (plotting) or C (curve), etc, should be clear from the context.

5. Misreads. When the data of a question is consistently misread in such a way as not to alter the nature or difficulty of the question, please follow through the candidate's work and transfer all the marks for the affected parts of the question to the new equivalent stages and numbers. Deduct 1 mark from any A or B marks earned in the affected part(s) of the question and record this by MR-1 in the margin. M marks are not deducted for MR.

6. The following additional abbreviations may be used in mark schemes or in marking:

BOD	Benefit of doubt given to the candidate;
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isw	Ignore subsequent working (after correct answer obtained), provided that the method has been completed;
oe	Or equivalent;
seen	The number or expression must be there to score;
soi	Seen or implied (eg by subsequent work);
SOS	See other solution;
T&E	Trial and error;
WW	Without any working (ie answer only given);
www	Without wrong working - used in scheme where a 'correct' answer might come from two errors cancelling;

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Condone clear transcription errors from correct answers in the working space to wrong answers in the answer space. Such errors will be extremely rare.

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SECTION A

Question Number	Marking Scheme Details			
1.	(a) 5,007	1		
	(b) 4,497	2/1		M1 for -510 seen
2.	(a) x 2 or equivalent	2		SCI for x ½
	(b) x 3/2 or equivalent	2		SCI for x 2/3
3.	(a) 26	2		M1 for 8 + 8 + 5 + 5 seen
	(b) 4 sides correct ± 0.2 cm	1		
	4 angles 90 ± 2°	1		
4.	(a) 0 to 0.25	1		
	Summer, temperature high, etc	1		
	(b) Arrow consistent with comment	2		SCI 0.55 to 0.95 SCI More men than women drive lorries
5.	(a) 25	2		M1 for (33+19+16+32+34+16)/6
	18	2		M1 for 16 - 34 seen
	(b) Either Kim or Pat with valid reason	B2	isw	Reason must explain choice eg. Kim is more consistent. Pat could score more. Allow consistent f.t from (a)
6.	(a) 0.8 ± 0.01	1		
	(b) Correct pointer ± 2°	2		Accept mark on the scale
7.	170	4		M2 for 20/100 M1 (dep) for x 850
8.	(a) Lightoaks	2		
	(b) 021 (or 022) 416 (or 417)	2		SCBI for 02 ..... 41 .....
	(c) or/and Church	2		
9.	£6.75	4		SCBI for figs 133 seen SCBI for figs 192 seen M1 for 10 (00) - (his 133 + his 192) soi
10.	9.9 ± 0.1 seen or 10 squares on diagram	1		Alt. 6.5 ± 0.1 or 5.7 ± 0.1
	3.5 ± 0.1 seen or 3½ squares on diagram	1		Alt. 5.4 ± 0.1 or 6.1 ± 0.1
	17.4 ± 0.8	2		M1 for ½ his 10 x his 3.5
11.	(a) 900	2		M1 for 450 x 18/9
	(b) 300 or ∫ (a) ÷ 3	2		M1 for 450 x 6/9

GCSE EXAMINATIONS
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Question Number	Marking Scheme Details			
12.	12	B2		
13.	(a) (i) 20 22 24 26 28 (ii) 21 24 27 (iii) 20 25 (b) Prime	1 1 1 1	In each part, additional numbers loses mark. SC2 for (20) ~~21~~ (22) 23 (24) 25 (26) ~~27~~ (28) 29 Allow definition of Prime	
14.	(a) 23 (b) Would expect a more 'normal' distribution.	2 2	M1 for 7+3+1+2+2+1+7	
15.	£15000	4	M1 for 350 x 40 M1 (dep) for + 1000 A1 for 14000 seen	
16.	(a) 29 Differences of 4 (b) 100 100th term is 397	1 1 1 1	i.s.w.	
17.	(a) Points P1 + P1 (± ½ small square) (b) More rainfall - less sunshine	2 B2	i.s.w.	
18.	Rectangle 3 x 6 Correct position	B2 B2		
19.	(a) 9 (b) (i) 160 (ii) 150	3 3 1	M2 for 12 x 3/4 SC1 for final answer of 3 (or 9000) M2 for 100 x 24/115	
20.	-3 (°C)	2	M1 for 5-8 seen	
21.	(a) BAC = 65° Isosceles triangle or AB=BC ABC = 50° Sum of angles of triangle (b) 110° AC//ED or equivalent (c) 213.5 to 214	1 1 1 1 1 1 2	dep. on previous 1 dep. on previous 1. Allow 180-130, etc., seen dep. on previous 1 M1 for 2.π.34	

Question Number	Marking Scheme Details			
22.	(a) 10 24 (b) 35	1 1 1		
23.	(a) 66 ± 2 (b) 56 ± 2 (c) Statements (d) 3/100 or 0.03 or 3%	2 2 1 + 1 2	SCI for 33 ± 1 or for 62 to 70 SCI for 28 ± 1 or for 52 to 60 No colour from 61-66. Colour increased, b/w decreased during 71-81. Any other correct comparison. SC1 for 3 in 100, 3 out of 100, 3:100	
24.	(a) 13 15 17 19 $64 = 4^3$ (b) 10 (c) 8000 (d) $x + 2$	1 1 1 B2 1	B1 for 20^3 seen	
25.	Bearing from Hartland 070 ± 2° Bearing from Appledore 320 ± 2° S marked and labelled at intersection of his two lines	1 B2 1		
26.	(a) Plots Curve (b) 3.6 to 3.8 (c) At least 3 trials 3.74	P1 C1 √1 M2 A1	Allow for 5 correct to ½ small square. Allow for quadratic curve through 0 and four other correct points. dep. on appropriate part of curve or straight line joins. 3 trials must be from 3 to 4 inclusive. Accept 2 trials if (b) legitimately 3.75. Final answer must be indicated.	
27 (a)	<table><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td>RB</td><td>RB</td><td>RY</td></tr><tr><td></td><td>BB</td><td>BB</td><td>BY</td></tr><tr><td></td><td>YB</td><td>YB</td><td>YY</td></tr></table>	2	SCI if just one error or if any pair(s) reversed.	
(b)	4/9	2	M1 for 1-5/9 seen	

Question Number	Marking Scheme Details		
	SECTION B		
28.	Attempt at pictogram, bar chart or pie chart Layout Bar Chart: Axes X 1, Scales S1, Labels L1 — Pie Chart: Circle Size S1, Sectors R1, Labels L1 Accuracy	M2 1 1 1 A5	Pictogram: (Axis) X1, Symbol S1, Labels L1 — Frequency Polygon: Mark as Bar Chart — Number Line: Max M2 S1 L1 A1 (A1- all correct) - 1 for each error
29.	(a) 3 2 11 9 7 12 14 (b) Correctly copied 4 squares Any 4 from Diagonal /; Diagonal \; Corners of 4x4 square Corners of any 3x3 square 2x2 square in middle or top left or right or bottom left or right Ends of rows 2 and 3 Ends of columns 2 and 3 Zig Zags 3,8,14,9 or 2,12,15,5	5 1^ S4	B3 for any 3 columns correct or for any 2 rows correct S1 for each correct shading
30.	(a) Example (eg. washing) Reasonable approximation (b) 3 relevant statements eg. Axes not labelled Choice of scales Lack of information - more people, houses - hot summers, etc.	B2 B2 6	2 for each relevant statement After 0 allow SC2 for the first assumption eg. 1993 was a hot summer.

MEG

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GCSE EXAMINATIONS SUMMER 1994

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	SECTION A			
1(a)	9	3	M2 for 12 x 3/4 seen or SC1 for final ans of 3, or 9000	
(b)(i)	160	3	M2 for 100 x 24/15 soi	
(ii)	150	1		[7]
2	-3(°C)	2	M1 for 5 - 8 seen	[2]
3(a)	*BAC* = 65°	B1		
	Isosceles Δ or *AB* = *BC*	B1	Dep on previous B1	
	ABC = 50°	B1		
	ΣAngles of Δ = 180	B1	Dep on previous B1. Can be implied by "180 - 130" etc seen Special case: Use of *CA* = *CB* can score SC1 for 57½ or 57.5 and dep SC1 for ΣAngles or 180 - 65	
(b)	*CDE* = 110°	B1		
	AC // *ED*	B1	Dep on previous B1 Accept appropriate use of equiv statements	
(c)	213.5 to 214	2	M1 for 2 x π x 34 seen	[8]
4(a)	10 24	1 + 1		
(b)	35	1		[3]
5(a)	66±2	2	B1 for 33±1 or for 62 to 70	
(b)	56±2	2	B1 for 28±1 or for 52 to 60	
(c)	No colour from 61 to 66 b/w decreased and colour increased 71 - 81 Any other correct comparison	2	Allow B1 for each equiv statement up to maximum of B2. Between them, statements must cover whole range, and must make a comparison.	
(d)	0.03 or 3/100 or 3% isw	2	Allow SC1 for 3:100 or for 3 in 100, etc	[8]
6(a)	13 15 17 19	1		
	(Sum =) 64 = 4^3	1		
(b)	(Row) 10	1		
(c)	8000	2	Allow B1 for 20^3 seen	
(d)	$x + 2$	1		[6]

Question Number	Marking Scheme Details			Part Mark
7	Ruled line bearing 70±2° from HP Ruled line bearing 320±2° from A S marked at intersection of his 2 ruled lines	1 2 1√		[4]
8(a)	Plots Curve	1 C1	Allow for 5 correct to ½ small square Allow for quadratic curve through 0 and four other correct points.	
(b)	3.6 to 3.8	1√	Dep on appropriate part of his curve or straight line join.	
(c)	At least three trials	M2	Three trials must be from 3 to 4 inclusive Accept two trials after 3.75 legitimately obtained from graph.	
	3.74	A1	Final answer must be identified.	[6]
9(a)	RB RB RY BB BB BY YB YB YY	2	B1 if one error or if any pairs reversed	
(b)	4/9 or 0.4̇ or 0.444 or 44.4%	2	SC1 for 4:9 or for 4 to 9 etc or M1 for 1 - 5/9 seen	[4]
10	(£)40.15	3	Either B2 for 40.14(..) or for 40.15p or M1 for 109.6 ÷ 2.73 soi by figs 4014(..)	[3]
11(a)	x^8	2		
(b)	1	1		[3]
12	78 to 78.3	3	M1 for $k = 35/10$ soi M1 (ind) for s = (his numerical k) x $\sqrt{500}$ or for (22.36 to 22.4) x k	[3]
13	Figs 854 $n \times 10^8$ $(1 \leqslant n < 10)$ isw Both isw	1 1 1	[$n \neq 2.86$]	[3]

Question Number	Marking Scheme Details			Part Mark
14 (a)	$\sqrt{3^2 + 7^2}$ soi	M2	Accept complete alternative methods 7.6 or 8 WW does not score	
	7.6 to 7.62 or 8	A1	7.6 < *AD* ≤ 7.62 WW scores M2A0	
(b)	*DCB* = arctan 3/5 soi = 30.96 to 31°	M2 A1	Accept complete alternative methods 31 WW does not score 30.96 WW implies M2	[6]
15 (a)	-1, 0, 1, 2, 3	3	-1 each extra or omitted term	
(b)	17, 18, 19, 20, 21	3	-1 each extra or omitted term Allow SC1 for 16.3 to 21.3 seen or for 17 to 21 seen	[6]
16 (a)	11.5	1		
(b) (i)	5.613636(...) isw	2	M1 for 12.35/2.2 seen or implied by 5.6(..)	
(ii)	6	1√		
(c)	Demonstration in working or statement that a value of w in range $11.5 \leq w < 12.1$ gives ans correcting to 5	2		[6]
17 (a) (i)	32/200 isw or 0.16 or 16%	3	Accept equivalent fractions SC2 for 32/(his(32+56+90+16+6)) isw or for 32:200 or 32 to 200 etc	
(ii)	106/200 isw or 0.53 or 53%	3	SC2 for (his(90 + 16)/(32+56+90+16+6)) isw or for 106:200 or 106 to 200 etc	
(b)	Plots	2	To ½ small square Allow P1 for one wrong plot or for plots translated horizontally by 1 cm in either direction from correct position in centre of ranges. Bar chart can score this P1 if no other plots seen.	
	Polygon of ruled lines joining his 5 points	1	Mark not available if bar chart seen Ignore anything to left of his (200, 32) or to the right of his (1800, 6)	[9]

Question Number	Marking Scheme Details			Part Mark
18 (a)	$3pq(4p - 5q)$	2	B1 for any correct partial factorisation.	
(b)	$2x^2 + 7x - 15$	2	B1 if one sign error or for $2x^2+10x-3x-15$	
(c)	$n = (C - 120)/40$ oe isw	2	B1 for $(C - 120)/40$ oe or $n = C - 120/40$ or for $40n = C - 120$ seen	[6]
19 (a)	117.7 to 118	3	M2 for $\pi \times 2.5^2 \times 6$	
(b)	34.87 to 34.9 isw	3	M2 for $6(1 + 1\% + 1\%^2)$, implied by 34.8 or M1 for $6 \times 1\%^2$	[6]
20	$\pi h(a + b)$ is the only one with units of area (or with dimensions 2)	3		[3]
21 (a)	Anticlockwise	1	Accept clear equiv wording	
(b) (i)	4	1		
(ii)	2	1✓		[3]
22 (a)	A ✓ B × C ✓ A ✓ B × C × A × B ✓ C ✓ A × B ✓ C × A × B × C ✓ A × B × C ×	2	B1 if one omitted. Ignore extras	
(b) (i)	0.18	3	M2 for $.8 \times .9 \times (1 - .75)$ or M1 for $.8 \times .9 \times k$ $(k<1)$	
(ii)	0.915	4	M3 for any complete correct method or M2 for $p(2) = .8 \times .9 \times .25 + .8 \times .1 \times .75 + .2 \times .9 \times .75$ or $p(1) = .8 \times .1 \times .25 + .2 \times .9 \times .25 + .2 \times .1 \times .75$ After M0, allow B1 for one of .2, .1 or .25 seen and M1 for $p(3) = .8 \times .9 \times .75$ or for $p(0) = .2 \times .1 \times .25$	[9]
23	-21.7 to -21.66 isw or -22	2	or B1 for figs [±] 21.4 to 22	[2]
24	2×10^{11} or 200 000 000 000	4	B3 for $k \times 10^{11}$ $(1.8 \leq k < 2)$ or 180 000 000 000 to 200 000 000 000 or M2 for $1.845 \times 10^{19} \times 0.01/1000^2$	[4]

Question Number	Marking Scheme Details			Part Mark
	SECTION B			
25(a)	16 3 2 13 5 10 11 8 9 6 7 12 4 15 14 1	3	B1 for any 3 correct cols or 2 correct rows	
(b)	Any correct definition of four groups	3	Mark first four B1 for any 3 correct groups	[6]
26(a)	(M_3 is) (5, 2)	1		
	(M_4 is) (4, 5½)	2		
(b)	$((x_1+x_2)/2, (y_1+y_2)/2)$	2	Interpret liberally any attempt to convey this idea : eg "Coordinates of M are the average of the other coordinates"	
(c)	Midpoint etc	1√	Accept any reasonable try to justify his answer to (b)	[6]
27(a)(i)	0.4242(...)	1	Accept $0.4\dot{2}$ if later work clarifies as $0.4\dot{2}\dot{7}$	
(ii)	4	1		
	Because each odd digit is a '4'	1	Accept explanation dependent on his interpretation if clear.	
(b)	x = 0.5151(..)			
	$100x$ = 51.5151(..)	1		
	$\therefore 99x = 51$	1		
	$x = 51/99$ isw	1		
(c)	Multiply by 1000	3	If he stops there, otherwise SC1 for Multiply by 1000 or $1000x = 123.123$ SC1 for Subtract x or $999x = 123$ SC1 for Solve equation or $x = 123/999$	[9]
28(a)	$x = 5$	1		
	$y = 6$	1	Accept implicit answers	
(b)(i)	$3^4 + 4^4 + 5^4 + 6^4 = 7^4$ or 'z^4'	1		
(ii)	lhs = 81 + 256 + 625 + 1296			
	= 2258	1√		
	rhs = 2401 ∴ not correct	1√	Accept any justifiable method of reaching conclusion.	
(c)(i)	Any power of odd no is odd	1	Accept any reasonable attempt to express this, using "odd"	
(ii)	Σthree odds + Σ(two) evens = odd	2	Accept "odd number of odds" Convincing argument required	
	l.h.s is odd but 8^5 is even ∴ cannot be equal	1	Independent of previous mark	[9]

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Add the part marks for each question and enter a ringed question total in the r.h. margin at the end of each question.

(b) Write the sum of all the ringed totals on the front of the script.

(c) The script total should agree with the sum of all the unringed part marks.

10. Please check that the addition and transcription of marks are correct.
Enter the script total on the mark sheet, following the instructions.
Any questions on use of the mark sheets will be dealt with at the main meeting.

SECTION A

1	(a) -1,0,1,2,3	3	-1 each extra or omitted term	
	(b) 17,18,19,20,21	3	-1 each extra or omitted term SC1 for 16.3 to 21.3 or 17 to 21	6
2	(a) 11.5	1		
	(b) (i) 5.613636(.....)	2	M1 for $\frac{12.35}{2.2}$ soi by 5.6..... Accept answer in working if 5.6 or 6 in answer space.	
	(ii) 6	1 ∫	(ft from (i))	
	(c) Statement or demonstration showing one case in the range $11.5 \leq w < 12.1$ which gives an answer rounding to 5kg.	2 ∫	f.t case in (b) where they have x 2.2 instead of divided.	
3	(a) $\frac{106}{200}$ isw oe (inc 53%)	3	M2 for $\frac{(90 + 16)}{\text{their } 200}$, - 1 for 106 : 200 etc.	
	(b) Polygon Plots	P2	to 1/2 small square, P1 for 1 wrong plot or for plotting at either end of interval. Bar charts can score P2 if centre points marked or joined, otherwise P1 for correct heights.	
	Joins	L1	Must be ruled, condone extra lines not joining points. Indep of P2	12
4	(a) $3pq(4p - 5q)$	2	B1 any correct partial factorisation seen.	
	(b) $2x^2 + 7x - 15$	2	B1 one sign error or for $2x^2 + 10x - 3x - 15$	
	(c) $n = \frac{C - 120}{40}$ oe	2	B1 $40n = C - 120$ soi or for $n = C - 120/40$ $\frac{C - 120}{40}$ (no n =) look back for n = seen otherwise B1	
5	(a) 117.7 to 118	3	M2 for (V =) $\pi \times 2.5^2 \times 6$	
	(b) 34.87 to 34.9	3	M2 for $6 + 6 \times \frac{7}{4} + 6 \times \frac{7}{4} \times \frac{7}{4}$ or M1 for $6 \times \frac{7}{4} \times \frac{7}{4}$ In (b)Accept 2.5 as MR for 6 and award M marks but do not do so for use of their V	12

6	$\pi h(a+b)$ or (iii) because it is the only one with units of area (or dimensions 2).	3	Accept because it is the only one which is an area. B1 for any mention of units or dimensions.	
7	(a) anticlockwise (b) (i) 4 (ii) 2	1 1 1✓	accept clear equivalent ft 1/2 their (i)	6
8	(a) A✓B✗C✓; A✗B✓C✗; A✓B✗C✗; A✗B✗C✓; A✗B✓C✓; A✗B✗C✗; (b) 0.915 oe	2 4	B1 1 omitted ignore extras that are duplicates M2 for P(2catch) = 0.8x0.9x0.25 + 0.8x0.1x0.75 + 0.2x0.9x0.75 M1 for P(3 catch) = 0.8x0.9x0.75 If M2 not earned allow B1 for one of 0.25, 0.1, 0.2. seen If working with 0 or 1 catching then M2 for P(1 catching) and M1 for P(0 catching)	
9	- 21.66 to - 21.7 or - 22	B2	B1 for $\pm$ (21.4 to 22)	
10	2×10^{11} or 200 000 000 000	B4	B3 for $k \times 10^{11}$ $(1.8 \leq k < 2)$ or k = 2.0 or for 180 000 000 000 to 200 000 000 000 or M2 for $\frac{1.845 \times 10^{19} \times 0.01}{1000 \times 1000}$ soi	12
11	(a) $72^{1/2}$, $18^{1/2}$ oe (b) (i) 24 (cm) (ii) irrational since side is $\sqrt{18}$ (which is irrational) or complete,correct argument based on a s.f of $1/\sqrt{2}$	2 1 2	- 1 for each error or omission SC1 for 72, 18 B1 for $\sqrt{18}$ soi by 16.97....or 4.24..... or irrational soi.	
12	93.7 - 93.8 (m)	4	M1 for 50 tan x + M1 for tanx = 3/1.6 or M1 for BC/50 = 3/1.6 oe or t = 50/1.6 + M1 for 50 x 3/1.6 A1 for 94 (m) If they go on from 93.75 it must be clear that 93.75 was their BC in which case M1 M1 A0 otherwise M0	9

13	$T = 0.2\sqrt{L}$	5	M1 for $T = k\sqrt{L}$ soi M1 for $1.6 = k\sqrt{64}$ soi A1 for (k=) 0.2 k = 0.2 implies M1, MI and can be implied by e.g. T = L/5 or 5T = L SC4 for correct implicit form,or incorrect implicit form after a correct explicit form seen. If no T = then look back for T = and award 5 otherwise award SC4	
14	Three clear, different criticisms	4	Not everyone has a phone, Biased against those not available Small sample size, Did not ask local bus, Only asked about last week. Only on one evening Only one time of day Adverse reaction to 'phone sampling e.g lying No evidence that they ensured a representative sample (may be alluded to in many ways but scores once only) B2 for 2 criticisms B1 for 1 criticism	
15	(a) Complete tree diagram (b) 0.15 oe	2 3	B1 for one error or omission M2 for their 0.8x0.1+0.2x0.35 M1 for one term correct. If method destroyed by e.g. dividing by 2 at end then M1 can be scored but not M2	14

16	(a) Darren : 2.25 to 2.35 and Fiona : 2.295 to 2.305	2	B1 for Fiona : 3 s.f.and Darren : 2 s.f. oe or for Fiona is more accurate than Darren	
	(b) 2.8 (years)	2	B1 for clear indication that 1 means 1 to 2 etc.	
17	(a) $2\mathbf{p} + 8\mathbf{q}$	2	M1 for $\mathbf{AO} + \mathbf{OC}$ soi $\mathbf{p} + 4\mathbf{q}$ after $2\mathbf{p} + 8\mathbf{q}$ gets M1 only	
	(b) Either $\mathbf{CD} = \mathbf{p} + 4\mathbf{q}$ or $\mathbf{AD} = 3\mathbf{p} + 12\mathbf{q}$ Completion	M2 A1	Argument implying A,C and D collinear	9
18	(a) (i) Tangent drawn at $t = 5$	1	No "daylight" at $t = 5$ and no crossing of curve.	
	(ii) 1.6 - 2.0	2	M1 for $\frac{\text{y step}}{\text{x step}}$ (relative to scales) seen Gradient marks dep on attempt at tangent drawn	
	(iii) Acceleration	1		
	(b) 84 - 86 (m)	5	B4 for 82 - 88 (m) M3 for correct method for the estimation of the area over the whole range 0 - 6s and conversion to distance. B2 for 66 - 70 (cm^2)	9
19	(a) (i) 90^0	1		
	(ii) $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$	2	B1 for 1 correct column in a 2x2 matrix or for $\begin{pmatrix} 0 \\ 1 \end{pmatrix}\begin{pmatrix} -1 \\ 0 \end{pmatrix}$	
	(iii) $\begin{pmatrix} 0 \\ -4 \end{pmatrix}$	2	B1 for one correct component or for coordinate form	
	(b) (2, -2)	2	B1 for one correct co-ordinate or for column vector form In all parts condone omission of brackets	
	(c) Reflection in $y = -x$	M1 A1	Any mention of second transformation gets M0	9

20	(a) (i) 3 (ii) £8 (iii) £5.50 (iv) 15 or £8 www	1 2 2 2	M1 for vertices used (at least2) or $x + y = k$ drawn. If 0 scored SC5 for (i) 4, (ii) £7.50, (iii) £6(iv)13 or £7.50 www (MR boundaries excluded)	
	(b) 3 , 4	1 +1	M1 for line $2y = x$ drawn (accept freehand)	9
21	(a) Graph of 2 f(x) [through (-2, 0),(2, 0),(0,2) and close to (-4,-2) and 4,-2)]	2	B1 for correct curve for $y \geq 0$	
	(b) f(x) translated by $\begin{pmatrix} 1 \\ 0 \end{pmatrix}$	2	Ignore curve for $x < -3$ B1 for max at (1, 1) or for translation through $\begin{pmatrix} -1 \\ 0 \end{pmatrix}$	
22	(a) 17 (m) 15 (cm) or 14.9 or 14.99....	3	B2 for both 23.5 or 23.49 or 23.499.... and 6.35 seen or M1 for max(23) - min (6.4) soi or SC2 for 17m 14cm, 17m 14.9cm etc	
	(b) (i) 3.25 (km)	3	B1 for 16.25 soi M1 for their (16.25) x 0.2 treat 16.25mm leading to 0.325 as MR	
	(ii) 0.299 - 0.3 (km^2)	3	B1 for 7.5 soi by 7.49(.....) M1 for their7.5 x (figs 2)^2	13

	SECTION B			
23	(a) 100x =51.515151..... 99x = 51 $\frac{17}{33}$ or $\frac{51}{99}$	1 1 1	Marks are indep	
	(b) Step 1: Multiply by 1000 (only)	3	If continued then mark at the stages : 1 Multiply by 1000 1000x = 1 Subtract x 999x 1 Solve the equation divide by 999 Give marks as earned on either the LHS or the RHS of the part (a) question layout	6
24	(a) $3^4 + 4^4 + 5^4 + 6^4 = 7^4$ 2258, 2401 so incorrect (or LHS even, RHS odd)	1 1ft	Conclusion must be there. Accept $81 + 256 + 625 + 1296 \neq 2401$ f.t. from $3^3 + 4^3 + 5^3 + 6^3 = 7^3$ to 432, 343 f.t. from $3^4 + 4^4 + 5^4 = 6^4$ to 962, 1296	
	(b) (i) odd x odd is always odd	1	Accept all powers of 3 are odd	
	(ii) Convincing argument to prove that LHS is odd. Must include 3 odds, (2)evens and addition	2	B1 for clear statement that there are three odds.	
	LHS odd but 8^5 even or 8^5 even so not equal	1	Indep In both parts: simple evaluation is insufficient, look at all evidence and give 0 if contradictory.	6

25	Diagrams	D4	D1 for each diagram up to 4 which shows the 4 pieces of information (2 years, 2ages). These could be combined into two or even one diagram(s). e.g bar charts, histograms, pie charts pictograms, cumulative frequency graphs, frequency polygons etc.	
	Quality	Q1	Lost for, serious inaccuracies, non labelling, clearly thinking all ages are adults, freehand (except cumulative frequency) Dep on at least D2	
	Statements comparing the information	4	1 each up to 4 for any of the following. 1. All ages (adults) : accidents increase as the year goes on 2. Under 15 : accidents highest in the summer months 3. All ages (adults): total (or mean) higher in 1989 than 1990 4. Under 15 : total (or mean) higher in 1990 than in 1989. 5. Comparing any 2 relevant standard deviations 6. Comparing any 2 relevant % going across the table. 7. Comparing any 2 relevant % going down the table. 8. Comparing relevant medians from c.f. graph 9. Comparing relevant quartiles from c.f. graph 10.Comparing number of accidents per year of age.	9
26	(a) (i) 3	1		
	(ii) 4	2	B1 for 2b = their (i) soi e.g. by $\frac{3}{2}$ or $1\frac{1}{2}$	
	(b) (i) c = 2 and 3	2	B1 for either, -1 for each wrong one unless justified by an assumption	
	assume c^2 means c x c	1	cao	
	(ii) 4 or 1/4 assume p/q means p ÷ q	2		
	or ÷ is the opposite of x	1		9

MEG

MIDLAND EXAMINING GROUP

GCSE EXAMINATIONS SUMMER 1994

MARKING SCHEME

for

MATHEMATICS (without coursework) PAPER 4 (1660/4)

Notes:

1. This Marking Scheme is a working document prepared for use by Examiners, all of whom are required to attend a Standardisation meeting to ensure that the Marking Scheme is consistently interpreted and applied in the marking of candidates' scripts.

2. MEG will not enter into any discussion or correspondence about any Marking Scheme. It is acknowledged that there may be different views about some matters of emphasis or detail of a Marking Scheme. It is also recognised that, without the benefit of attendance at a Standardisation meeting, there may be different interpretations of the application of a Marking Scheme.

GCSE MATHEMATICS - SYLLABUS 1660/1661

GENERAL INSTRUCTIONS

1. Use red ink, biro or pencil for marking and HB pencil for entering marks on mark sheets.

2. The Marking Scheme must be applied precisely and no departure made from it. Marks must be awarded as indicated - no further subdivision is to be made.

3. Errors or omissions should be indicated in some way so that the reason for a loss of marks is clear. There should be evidence that all the candidate's work has been examined. If the reason for a particular decision is not obvious, please give a brief explanation. Use the symbol $\surd$ to indicate correct work following a previous error, and $\surd\!\!\!\!\times$ to show that a further mistake has been made.

4. Types of Marks
   - M (method) marks are not lost for purely numerical errors.
   - A (accuracy) marks depend on method marks.
   - B marks are independent of method marks. Unlabelled marks in the scheme are B marks.
   - SC marks, awarded for a special case, as indicated in the comments, where a fully correct answer has not been given.

   The meaning of other labels, such as P (plotting) or C (curve), etc, should be clear from the context.

5. Misreads. When the data of a question is consistently misread in such a way as not to alter the nature or difficulty of the question, please follow through the candidate's work and transfer all the marks for the affected parts of the question to the new equivalent stages and numbers. Deduct 1 mark from any A or B marks earned in the affected part(s) of the question and record this by MR-1 in the margin. M marks are not deducted for MR.

6. The following additional abbreviations may be used in mark schemes or in marking:

BOD	Benefit of doubt given to the candidate;
cao	Correct answer only (to emphasise no follow through);
isw	Ignore subsequent working (after correct answer obtained), provided that the method has been completed;
oe	Or equivalent;
seen	The number or expression must be there to score;
soi	Seen or implied (eg by subsequent work);
SOS	See other solution;
T&E	Trial and error;
WW	Without any working (ie answer only given);
www	Without wrong working - used in scheme where a 'correct' answer might come from two errors cancelling;

7. Unless otherwise specified in the scheme, eg by www, a correct answer in the answer space will be taken as evidence for a correct method.
If the answer space is blank, mark the last line in the working space.
If a candidate offers two answers in the answer space, without indicating any preference, mark the worse.
An answer marked 'isw' in the scheme can score in the working if not seen on the answer line. Note that 'isw' does not apply where the correct "answer" is reached before the candidate completes his/her method.
Condone clear transcription errors from correct answers in the working space to wrong answers in the answer space. Such errors will be extremely rare.

8. If the answer is not worth full marks for that part of the question, look for evidence for method marks or part marks as indicated by the marking scheme.

9. The mark awarded for each part-question, including zero where appropriate, should be recorded in the margin next to the corresponding total available mark for that part, shown in square brackets on the script.

(a) Section A:
Question totals are not required, but please enter ringed totals, at the bottom of the margin of each r.h. page, and at the bottom of the last page of the Section.
Section B (1660 only):
Add the part marks for each question and enter a ringed question total in the r.h. margin at the end of each question.

(b) Write the sum of all the ringed totals on the front of the script.

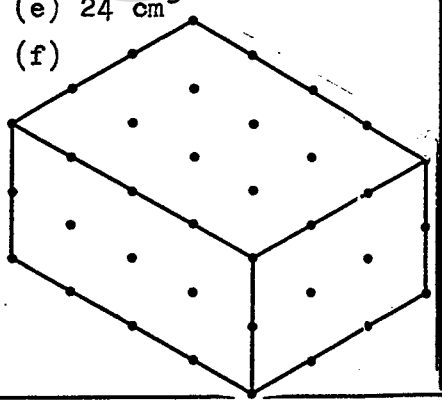
(c) The script total should agree with the sum of all the unringed part marks.

10. Please check that the addition and transcription of marks are correct.
Enter the script total on the mark sheet, following the instructions.
Any questions on use of the mark sheets will be dealt with at the main meeting.

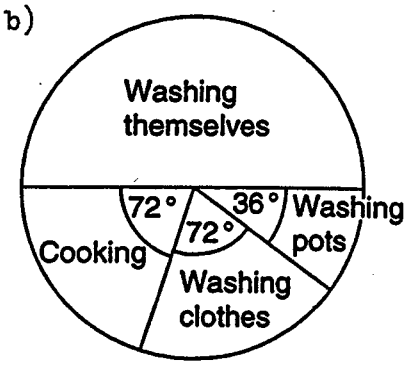
GCSE EXAMINATIONS
MARKING SCHEME JUNE 1994

Question Number	Marking Scheme Details		
	SECTION A		
1.	(a) 7	2	SC 2 for two consistent 'answers' e.g. 6 and 14.
	(b) 5	2	
2.	(a) (i) 5,4,3,2,1. (ii) 4,5,6,7,8. (iii) same sequences reversed.	2	Minimum for 2 marks: Forwards & backwards; Up & down; Decrease & increase; Reverse order; 1 to 8 & 8 to 1. For 1 mark: Same set of numbers; Numbers follow on; Difference of 1 each time.
	(b) All pairs of digits add to 9. OR All are in pairs - 18 & 81, 27&72, etc.	2	SC 1 for right idea as in LH column, but inadequately explained. SC 1 for 'alternately odd & even'. 0 for 3 or 9 times table, or multiples of 9.
	Answers to (a)(iii) and (b) are interchangeable. If the same idea is used in both answers, however, mark the better & give 0 to the other.	(8)	
3.	(a) 6.09, 6.10 or 6.11 m	2	Accept any single number between 6.08 & 6.12, or any range within $6.08 < x < 6.12$.
	(b) 1st Donna 3rd Anne 4th Emma 5th Beth 6th Candy	3	Five lengths in correct order - allow 3 MR -1. Give SC 1 for one (compensating) error. i.e. one name out of place, or two names interchanged.
	(c) 608 cm	1	
	(d) 18 to 22 feet	2	SC 1 for 30 (cm) seen.
	(e) 80 %	2	M 1 for $6.08 \times 100 \div 7.60$ or equiv, seen.
4.	(a) 3.8, w.w.w., or 3.818 to 3.822 m	2	M 1 for $12 \div 3.14$ seen and not spoilt. 3.81 as answer implies the M 1.
	(b) $4 \times 3 = 12$, or $12 \div 3 = 4$, or $12 \div 4 = 3$.	2✓	A simpler approximation to π must be seen. ✓ for mental check of wrong method e.g. 12 x 3.
	(c) 4.5, w.w.w., or 4.52.. cm^2.	3	M 1 for πr^2 + M 1 for $\pi \times 1.2^2$.
		(17)	

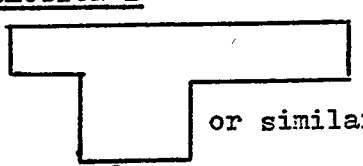
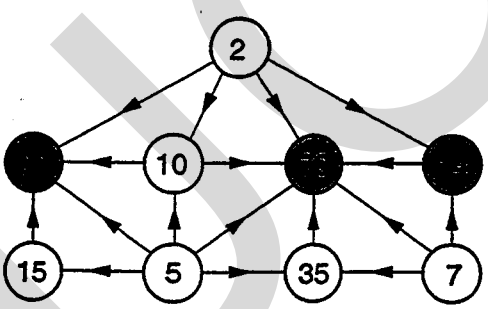
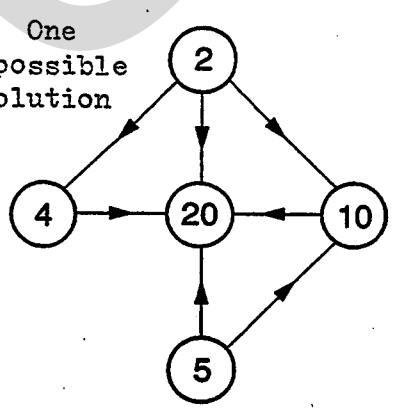
Question Number	Marking Scheme Details			
5.	(a) (8, 60°)	2	B1 + B1 ; ignore embellishments. SC1 for (60°, 8).	
	(b) Angle POC = 90° (by eye)	1	C could be a dot, or the end of a line, or just the letter C by itself.	
	OC = 5 cm (±0.1)	1	indep.	
	(c) (i) D marked, with or without a dot, or a line.	1	BD = 8 cm (± 0.2)	
	(ii) Equilateral	1	Condone spelling, but must be recognisable	
	(iii) Explanation that mentions equal sides or 60° angles.	1	indep.	
6.	(a) IN: 8 ; OUT: 8, 11	3	1 mark each.	
	(b) Points √ correctly plotted (±1 mm)	2√	Give 1 for two correct.	
	(c) A straight line	1	Allow 'line', 'straight' or 'diagonal'. Line need not be drawn, but their points must be in a straight line.	
		(13)		
7.	(a) 61 mm	3	M1 for an attempt to add and divide by 12. B1 for 732 seen.	
	(b) (i) 352 mm	1	SC1 for (i) 0 to 352 and (ii) 29 to 84.	
	(ii) 55 mm w.w.w.	2	M1 for an attempt to subtract two numbers in the Great Britain row, seen.	
	(c) The Gambia	1	If the answer here is Great Britain, the maximum mark is (c)0, (d)1 - for a sensible comment on the means.	
	(d) A sensible statement which compares the amount of rainfall (means)	1		
	the distribution of rainfall (ranges)	1	indep.	
	(e) 55 to 65 (mm)	2	M1 for an attempt to classify data seen or SC1 for a single number within the range 55-65, or a range within that range.	
8.	(a) C = 24n, or equiv.	2	SC1 for n times figs 24 in an answer containing extraneous terms. SC1 for right answer in working space, but wrong answer in answer space.	
	(b) y = x + 3, or equiv.	2	SC1 for 'add 3 to x' or other verbal description containing x.	
		(15)		

Question Number	Marking Scheme Details			
9.	(a) A (-5,2) B (1,-4)	1 1	0 if x and/or y appear in the coordinates SC1 for (2,-5) and (-4,1), or for A (1,-4) and B (-5,2).	
	(b) -4, 0, 1	2	Give 1 for two correct.	
	(c) Correct straight line drawn.	2	If line incorrect, give 1 for three or more correctly plotted points.	
	(d) (-0.5, -2.5) $\pm$0.1 on each coord.	1√	√ is for the correct coordinates of the point at which their two lines cross.	
10.	(a) 0.35 or $\frac{7}{20}$	3	M2 for 1-(0.2 + 0.15 + 0.3).	
	(b)(i) The probabilities are not equal	1	or it has more chance of falling on 2. or all the probabilities should be equal.	
	(ii) All the same 0.25, $\frac{1}{4}$, 1in4, 25% each	1 1	indep. Not 'fair' or 'even'.	
	(c) (i) 16 points plotted, forming a square.	2	1,1 1,2 1,3 1,4 2,1 2,2 2,3 2,4 3,1 3,2 3,3 3,4 4,1 4,2 4,3 4,4 B1 for 8 points correct, and none wrong.	
	(ii) Ring round (4,2), (3,3) and (2,4).	2	B1 for 2 correct and none wrong.	
		(17)		
11.	(a) 34 cm	2	M1 for attempt to add lengths seen. The answer 22 implies M1	
	(b) 44 cm^2	2	M1 for attempt to find areas of some rectangles seen, and not spoilt. or SC1 for answer 52.	
	(c) A 4x2cm face, accurate by eye, drawn in any possible position, along the top edge.	2	M1 for rectangle in correct possible position, but inaccurate by eye.	
	(d) 4 cm, 3 cm, 2 cm	2	In any order. B1 for any two correct.	
	(e) 24 cm^3	2√	M1√ for 4x3x2, and not spoilt.	
	(f) 	3	M1 for an isometric box, + A1 for two of the three dimensions correct. Allow SC1 for non-isometric box, if the vertical and diagonal dimensions are two of 2,3 and 4.	
		(13)		

Question Number	Marking Scheme Details		
12.	(a) Line $\frac{3}{4}$ of the way up the bottle.	2	Judge by eye; accept straight line or meniscus. Allow $\pm\frac{1}{2}$ cm from correct position.
	(b) Figs 40 x figs 140,142, 145,150 or 100	M1	
	£56 or 5600(p)	A1	or other answers corresponding to approximation used.
	(c) 142 x 39 / 1278 / 426 / 5538 i.s.w.	M1 A2	M1 for demonstration of a complete non-calculator method, with or without errors. e.g. Long multiplication. Successive addition. Multiplication in stages. $142 \times 39 = 55^{16}3^{7}8$ (showing carries).
13.	(a) 1536 cm^2 c.a.o.	2	M1 for 64x24, s.o.i.by digits 1536.
	(b) (i) 104 cm^2	3	M1 for 10x8 (implied by 80 seen) M1 for $\frac{1}{2}$x8x6(implied by 24 seen) indep.
	(ii)	3	All correct and no repetitions. B2 for five or more correct and nothing incorrect.(Ignore repetitions). B2 for all correct other than RR and/or BB included. SC1 for three or more correct, and more right than wrong.(Ignore repetitions). Accept R instead of Red, etc.
	(15)		
14.	(a)(i)81 litres	2	M1 for $\frac{90}{360}$ x 324 or equiv.
	(ii) $\frac{54}{360}$ ($=\frac{3}{20}$) or equiv.	1	0 for 0.15 or 15%. Allow 48.6 litres.
	(b)	3	B1 for Washing themselves = $\frac{1}{2}$ circle. B1 for other three sectors accurate ($\pm 2^{o}$ on each angle). B1 for four sectors filling the whole circle and all labelled correctly. (indep.)
	(6)		



Question Number	Marking Scheme Details			
15.	(a) (i) £52.15	2	M1 for $\frac{17\frac{1}{2}}{100}$ x 298. Treat $\frac{17}{100}$ or $\frac{7\frac{1}{2}}{100}$ as MR.	
	(ii) £350.15	1√	SC1 for (a)(i) £350.15 (ii) anything.	
	(b) (i) $\frac{1}{6}$ or $\frac{5}{6}$ of their £423.	M1	Allow if decimal equivalents, to 2 d.p.or more but truncated or rounded, used instead of $\frac{1}{6}$ or $\frac{5}{6}$.	
	(£)70.5(0) or (£)352.5(0).	A1	M1 can be implied by 70.5(0) seen.	
	£7.50	B1	The zero must be there. This is the only mark earned unless the answer is supported by working.	
	(ii) Berries	1√	dep. on M1 in (b)(i).	
16.	(a) (i) x 10 ; -1 .	2		
	(ii) L = 10n -1 or equiv.	2√	Must not be L = 10n - 9. SC1 for 10n -1.(√)	
	(b) (i) 75, 125, 175, 225	2	1 mark for three correct.	
	(ii) Row 18 c.a.o.	1		
	(iii) Clear explanation	2√	Could be earned by a mathematical method in (b)(ii). e.g. $\frac{875 - 25}{50} + 1$.	
			dep. on the table in (b)(i)being filled in.	
			√ if explanation consistent with wrong(b)(i).	
			1 mark for unclear explanation with right idea but no numbers or list seen anywhere; or pattern described but no clear method.	
		(16)		
	TOTAL FOR SECTION A	120		

Question Number	Marking Scheme Details			Part Mark
17.	SECTION B (a) (i)  or similar.	4	Condone inaccurate drawing if intention clear. SC1 for a right polygon with more than 8 sides.	
	(ii) 6 90° angles 2 270° angles	1 ✓ 1 ✓		
	(b) (i) 360° (ii) 720° (iii) 1080°	1 1 1	SC2 for 4,8 and 12 (right angles).	
	(c) 6 and 2 in column 3. 360,720 and 1080 in row 4.	1 ✓ 1 ✓	✓ for their numbers correctly transcribed to table from earlier parts.	
	Column 4: 10, 7, 3, 1440° or 16 Column 5: 12, 8, 4, 1800° or 20	4	For each column, 1 mark for first three numbers, 1 mark for last number.	
		(15)		
18.	(a) 	2	B1 for each correct line and arrow. -1 if 2 and 7 connected. (min 0).	
	(b) 	8	2 for the first correct entry; 1 for each correct entry after that, + 1 for all correct.	
	(c) One possible solution 	5	M1 for a factor diagram (different from the example and (a)) with at least three numbers. A1 for any two correct lines and arrows. A3 for correct complete factor diagram, with at least 3 more lines and arrows. -1 (from the A3 only) if the largest number is not 20; and for each missing or incorrectline or arrow(min 0)	
		15		

N.B. Allow 1 as a factor- but it must have a line&arrow to every other entry.

TOTAL FOR SECTION B – 30

MEG

MIDLAND EXAMINING GROUP

GCSE EXAMINATIONS SUMMER 1994

MARKING SCHEME

for

MATHEMATICS (without coursework) PAPER 5 (1660/5)

Notes:

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GCSE EXAMINATIONS
MARKING SCHEME JUNE 1994

Question Number	Marking Scheme Details	Part Mark

GCSE MATHEMATICS - SYLLABUS 1660/1661

GENERAL INSTRUCTIONS

1. Use red ink, biro or pencil for marking and HB pencil for entering marks on mark sheets.

2. The Marking Scheme must be applied precisely and no departure made from it. Marks must be awarded as indicated - no further subdivision is to be made.

3. Errors or omissions should be indicated in some way so that the reason for a loss of marks is clear. There should be evidence that all the candidate's work has been examined. If the reason for a particular decision is not obvious, please give a brief explanation. Use the symbol ✓ to indicate correct work following a previous error, and ✗ to show that a further mistake has been made.

4. Types of Marks
   - **M** (method) marks are not lost for purely numerical errors.
   - **A** (accuracy) marks depend on method marks.
   - B marks are independent of method marks. Unlabelled marks in the scheme are B marks.
   - SC marks, awarded for a special case, as indicated in the comments, where a fully correct answer has not been given.

   The meaning of other labels, such as P (plotting) or C (curve), etc, should be clear from the context.

5. Misreads. When the data of a question is consistently misread in such a way as not to alter the nature or difficulty of the question, please follow through the candidate's work and transfer all the marks for the affected parts of the question to the new equivalent stages and numbers. Deduct 1 mark from any **A** or B marks earned in the affected part(s) of the question and record this by MR-1 in the margin. **M** marks are not deducted for MR.

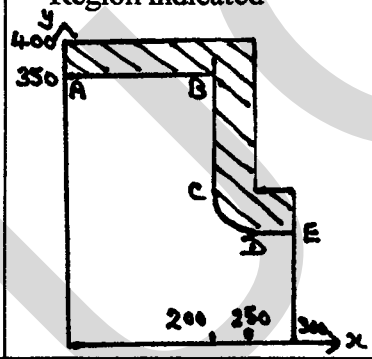
6. The following additional abbreviations may be used in mark schemes or in marking:

BOD	Benefit of doubt given to the candidate;
cao	Correct answer only (to emphasise no follow through);
isw	Ignore subsequent working (after correct answer obtained), provided that the method has been completed;
oe	Or equivalent;
seen	The number or expression must be there to score;
soi	Seen or implied (eg by subsequent work);
SOS	See other solution;
T&E	Trial and error;
WW	Without any working (ie answer only given);
www	Without wrong working - used in scheme where a 'correct' answer might come from two errors cancelling;

Question Number	Marking Scheme Details	Part Mark
	7. Unless otherwise specified in the scheme, eg by www, a correct answer in the answer space will be taken as evidence for a correct method. If the answer space is blank, mark the last line in the working space. If a candidate offers two answers in the answer space, without indicating any preference, mark the worse. An answer marked 'isw' in the scheme can score in the working if not seen on the answer line. Note that 'isw' does not apply where the correct "answer" is reached before the candidate completes his/her method. Condone clear transcription errors from correct answers in the working space to wrong answers in the answer space. Such errors will be extremely rare. 8. If the answer is not worth full marks for that part of the question, look for evidence for method marks or part marks as indicated by the marking scheme. 9. The mark awarded for each part-question, including zero where appropriate, should be recorded in the margin next to the corresponding total available mark for that part, shown in square brackets on the script. (a) Section A: Question totals are not required, but please enter ringed totals, at the bottom of the margin of each r.h. page, and at the bottom of the last page of the Section. Section B (1660 only): Add the part marks for each question and enter a ringed question total in the r.h. margin at the end of each question. (b) Write the sum of all the ringed totals on the front of the script. (c) The script total should agree with the sum of all the unringed part marks. 10. Please check that the addition and transcription of marks are correct. Enter the script total on the mark sheet, following the instructions. Any questions on use of the mark sheets will be dealt with at the main meeting.	

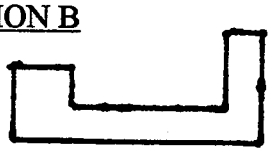
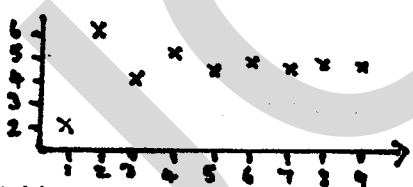
GCSE EXAMINATIONS
MARKING SCHEME JUNE 1994

Question Number	Marking Scheme Details			Part Mark
	SECTION A			
1	(a) 104	3	M1 for rectangle = 8 x 10 M1 for triangle = ½ x 8 x 6	
	(b) Design | Outer Part Red | Green Blue | Green White | Green Blue | Red White | Red Red | Blue White | Blue	3	All correct & no repetitions. B2 All correct (other than RR,BB included) B2 for 5 or 6 correct and nothing incorrect (ignoring repetitions). SC1 for 3 or more correct with more correct than incorrect.	(6)
2	(a)(i) 81 (litres)	2	M1 for 324 x 90/360 oe	
	(ii) 54/360 oe fraction isw	1		
	(b) Pie chart shows: (Washing themselves)½ circle Other 3 angles = 72°,72°,36° 4 sectors,largest & smallest labelled correctly, other two labelled with words	1 1 1	Tolerance ±2°	(6)
3	(a) figs 140 or 142 or 145 or 150 x figs 40 seen 5600(p) or 5680(p) or 5800(p) or 6000(p) £56 or £56.80 or £58 or £60	M1 A1	Answers only, 0 marks	
	(b) Evidence of valid non-calculator method eg 142 x39 / 1278 / 4260 / 5538 or 142 x 40 = 5680 5680 - 142 = 5538 figs 5538 isw	M1 A2		
4	(a)(i) (£)52.15(p)	2	M1 for 0.175 x 298 oe seen	
	(ii) (£)350.15(p)	1	ft for their (a)(i) + 298 After 0 marks, SC1 for (£)350.15(p) in (a)(i) answer space	
	(b)(i) (Berries) (Reduction =) (£)70.5(0) or (Reduced price =) (£)352.5(0)	2	M1 for (reduction=) 423 ÷6 soi or (reduced price=) 423 x 5/6 soi	
	Difference (£)7.50 (p)	1	cao	
	(ii) Berries	1	dep on M1 earned in (b)	(12)

Question Number	Marking Scheme Details			Part Mark
5	(a)(i) → [x 10] → [-1] →	2		
	(ii) L = 10n - 1	2	ft from (i). Must not be L = 10n - 9 Allow L = n x 10 -1 Allow in words. **SC1** for their 10n - 1.	
	(b)(i) Row | 1 2 3 4 5 Sum | 25 75 125 175 225	2	**B1** if one error made	
	(ii) (Row) 18	1		
	(iii) Clear explanation in words or figures	2	eg (875 - 25) ÷ 50 + 1 **B1** for incomplete explanation	
	(iv) (S =) 50n - 25 oe	3	**SC1** for (S =) 50n - c where c ≠ 0	
	Special case: After 25,50,75,100, 125 in (i) allow		**SC1** for (iii), **SC2** for (S=)25n in (iv)	12
6	(a)Cuboid, 300 cm long, drawn on correct wall	1	Correct 'by eye' at both ends	
	50cm high, 50cm from ceiling	1	'By eye'	
	25 cm from back to front	1	'By eye'	
	(b)(i) (300, 0, 250) (ii) (0, 400, 100)	3	**B2** for correct coords of one point only Condone omission of brackets After B0, allow **B1** for 3-D identification of either point in unconventional form.	
	(c) AB, BC, DE correct	1	'By eye'	
	Quarter circle CD correct	1	'By eye'	
	Region indicated	1	Dependant on at least 1 previous mark earned	
				9
7	(a)(i) Graph through (0,0) or (1,2)	1	Tolerance half small square	
	Straight line graph	1	Not parallel to Ox or Oy	
	Correct straight line	1		
	(ii) x = 1.5 to 1.6	1	ft from (i) dependant on intersection seen	
	y = 3(.0) to 3.1	1	ft from (i)	
	(b) Correct method used to find x or y	M2	May be implied by 13x = k oe or 13y = k oe If no working shown, give	
	(x =) $\frac{20}{13}$ or $1\frac{7}{13}$ isw	A1	**B2** for (x =) $\frac{20}{13}$, **B2** for (y =) $\frac{40}{13}$	
	(y =) $\frac{40}{13}$ or $3\frac{1}{13}$ isw	A1	After A0, give **SC1** for both x = 1.54 or better y = 3.08	

Question Number	Marking Scheme Details			Part Mark
8	(a) 0.35 , 35% , $\frac{7k}{20k}$	3	M2 for Pr=1- (0.2+0.3+0.15)	
	(b)(i) 0.45 , 45% , $\frac{9k}{20k}$	3	M2 for Pr = Pr(score 3) +Pr(score 4) or B1 for scores 3 and 4 identified	
	(ii)0.06 , 6% , $\frac{3k}{50k}$	3	M2 for Pr = Pr(score 1) x Pr(score 3) (+.....) or B1 for recognising only 1 then 3 needed	(18)
9	(a)Correct angle marked on map 250° to 252°	1 2	SC1 for 249° to 253°	
	(b)(i) Greatest 3560.5 (feet) or 3560.49(9..) Least 3559.5 (feet)	3	B2 for one correct	
	(ii)1084 to 1085 (m)	3	M2 for 3560 x $\frac{1609}{5280}$ oe	
	(c)Distance 6 to 10 (miles) Correct use of scale seen either on diagram or in calculation.	1 2	Do not accept answers to more than 1 dp B1 for either wrong use of scale (eg x) or for less satisfactory explanation.	
	(d) $\frac{\text{Ans (c)}}{2}$ + $\frac{3560 - 1171}{1200}$ 5 to 7 hours	M1 A1		(14)
10	(a)(i) 50°	1		
	(ii)Angle sum (of triangle) (180)	1		
	Base angles isos triangle	1	or Equal angles opposite equal sides oe eg angle B = angle D stated	
	(b)(i) 59 to 59.3 (cm)	3	M2 for $\sqrt{\{75^2 - (\frac{1}{2}x92)^2\}}$ or M1 for $h^2 + (\frac{1}{2}x92)^2 = 75^2$	
	(ii) 44 to 44.3 (cm)	3	M2 for $\frac{AC}{92} = \frac{36}{75}$ oe	
	(iii)52 to 52.3 (°) www	3	M2 for cosOBD = $\frac{46}{75}$ oe	
	(c) 60.7 to 61 (cm) www	3	M2 for $\frac{h}{90} = \frac{75}{(75+36)}$ oe	(15)
11	(a)(i) 50.1 (secs) or better isw	3	M1 for $\frac{x_1 \times 4 + x_2 \times 17 + ... x_5 \times 35}{120}$, and B1 for $x_1 = 25$, $x_2 = 35$, ... $x_5 = 65$	
	(ii) 40 - 50 (secs)	1		
	(b) Mean or Median	1		
	Sensible reason	1	eg takes account of high freq in 60 - 70 class for Pricewell	(6)
	(c)(i) Points plotted at upper ends of intervals	1	Must be rising frequency values to score	
	Correct cum freq plotted	1	4, 21, 69, 85, 120	
	(ii) Q_1 41.5 to 42.5 Q_3 61 to 63	1		
	IQ range 19.5 to 21.5	1	ft from their $Q_3 - Q_1$	
	(iii)Times at Pricewell more dispersed at upper end	2	oe	(6)

Question Number	Marking Scheme Details			Part Mark
12	(a) 365 to 366 oe in standard form	2	M1 for $\frac{(4.7689 \times 10^7)}{(1.3048 \times 10^5)}$	
	(b) 37.3×10^6 to 37.4×10^6 oe isw	2	M1 for $32.242 \times 10^6 + 5.132 \times 10^6$ oe (must be of the same order)	
	(c) 4.05×10^{-3} (km^2) or better	3	B2 for 0.00405 (km^2) or better M1 for $\frac{1.3048 \times 10^5}{3.2242 \times 10^7}$ or $\frac{2.077 \times 10^4}{5.132 \times 10^6}$ oe	
13	(a)(i) 39 - 41 (pence)	3	Allow use of diagram M2 for any correct calculation method seen eg $\frac{(120 - 75)}{120} \times 80+10$ or $75 = 135 - \frac{3}{2} \times$ transposed (methodically correctly)	
	(ii)Number sold = 90 Takings = £27 Profit = £7	1 1 1		
	(b) $\frac{x(135 - 3/2\,x) - 2000}{100}$ isw	3	SC2 for $x(135 - 3/2\,x) - 2000$ or M1 for $x(135 - 3/2\,x)$ seen	
	TOTAL FOR SECTION A (1660)	120		(16)
	TOTAL FOR 1661			

Question Number	Marking Scheme Details			Part Mark
	SECTION B			
14	(a)(i) 	1		
	or other correct octagon			
	(ii) 2 (angles of 270°)	1	depends on previous mark	
	(b)(i) 720°	1		
	(ii)1080°	1		
	(c)(i) Any correct argument	3	eg 3 angles all 90° and/or 270° give angle sum ≥ 270 ; impossible since angle sum of triangle = 180°. **B1** mention of triangle but explanation unconvincing	
	(ii) n = 5 or greater odd number	1		
	(d) Considers at least 1 case with n > 8 and presents results with a clear pattern eg Sides | 4 6 8 10 12 No of 270 | 0 1 2 3 4	2		
	Generalises correctly eg; If n odd, no right polygon exists	2	May be implied by a table containing only even values of n.	
	(If n even,) number of 270° angles = ½ n - 2	3	**B2** for n = 2(Number of 270s + 2)	(15)
15	(a)(i) 7th term = 4.625 8th term = 4.6875 9th term = 4.65625	2	**B1** for one term correct	
	(ii) 	2	or similar presentation. ft from (i)	
	(iii)Evidence of investigation with at least 1 other mean sequence	2	At least 5 terms seen. Condone errors in calculation.	
	Negative number(s) or fractions used as starting values	1	At least 5 terms seen	
	Conclusions: Starting numbers equal,all terms equal	1		
	terms go up and down oe	1		
	tend to a limit oe	2		
	(b) Evidence of looking for counter-example	M2	Comparing numerical a with numerical b x numerical c where a, b and c are successive terms of a mean sequence.	
	Counter example given	A2	eg 2, -2, 0 or 4, 1, 2½	(15)
	TOTAL FOR SECTION B	30		

MEG

MIDLAND EXAMINING GROUP

GCSE EXAMINATIONS SUMMER 1994

MARKING SCHEME

for

MATHEMATICS (without coursework) PAPER 6 (1660/6)

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Question No.	SECTION A			Part Mark
1	**(a)** Tape measure	B1		
	Need ~ 4 measurements ruler needs ~ 80	B1 dep	correct intention	
	∴ less chance of error			2
	(b) **(i)** Greatest = 50.5 or 50.49 (9....)	B1	Allow 36 or 35.99 (9....)	
	(ii) Least = 14.5 cao.	B1		
	(iii) (36) *Greatest* length remaining	B2	Marks for reason only, with no wrong statement	4
2			Condone correct tally if no totals shown	
	(a) 6, 6, 8, 5, 5	B2	All correct *OR* Allow B1 for 3 correct.	2
	(b) Using mid-intervals e.g. 45, 45.5 etc.	M1	3 or more correct	
	$\frac{1660}{30}$	M1 dep	Sum of mid-interval × frequency without working: 1673 MO; 1660 M1, M1; others MO	
		√ M1 dep	Divide by Sum of frequencies	
	$= 55\frac{1}{3}$ or 55.3 seen	A1	cao.	4
	(c) Widths 10, 4, 4, 4, 8 o.e.	B1	Ignore horizontal markings on axis	
	Heights 0.6, 1.5, 2, 1.25, 0.625 or 2.4, 6, 8, 5, 2.5 or multiples.	B1 B1, B1	for Middle 3 heights correct for Each End *dep* on both previous B marks gained no √ on heights BO if gaps	4

Question No.	SECTION A			Part Mark
3	**(a)** 2	B2	If zero scored allow SC1 for 'use' of $t = 0$.	2
	(b) **(i)** $37 = a + b + 2$	M1	uses $t = 1$ and/or $t = 2$ correctly (may be implied by opposite o.e.)	
	$62 = 4a + 2b + 2$	A1	both obtained validly.	2
	(ii) Multiply *and* subtract o.e.	M2	If by substitution give M2 for equn. in one unknown	
	$a = -5 \quad b = 40$	A1, A1		4
	(c) 20.75 or 20.8 or 21	B2	Allow SC1 for their a, b and $t = 7\frac{1}{2}$ substituted in formula	2
4	**(a)** **(i)** $OX = 10.5$	B1		
	(ii) $XB^2 = 14.5^2 - '10.5'^2$	M1	or other complete method	
	$XB = 10$	A1		
	$AB = 20$	√A1	f.t. only after correct method	4
	(b) $\sin x = \frac{'10'}{14.5}$	M2	or equivalent cos/tan.	
	$= 43.6° \ldots$ or 44° seen.	A1		3
	(c) $\frac{'87.2'}{360} \times \pi \times 14.5^2$	M2	After MO allow SC1 for $\frac{'87.2'}{360}$ seen or $\frac{360}{87.2}$	
	$-\frac{20 \times 10.5}{2}$	M1	Must subtract.	
	$= 55$ or rounds to 55	A1		4
5	**(a)** 5000×2.5^2	M1		
	$= 31250$	A1		2
	(b) $\frac{\text{his } 31250}{2^2}$	M1	Implied by 7812.5 ww.	
	$= 7812$	A1 cao.		2
	(c) $d = \sqrt{\frac{k}{N}}$ o.e.	B2	Allow B1 for $d^2 = \frac{k}{N}$	
			Allow k in figures. Ignore ±.	2
	(d) $\sqrt{\frac{'31250'}{2000}}$	M1	*OR* by complete method using original equation.	
	$= 3.95 \ldots$ or 4 seen	A1		2

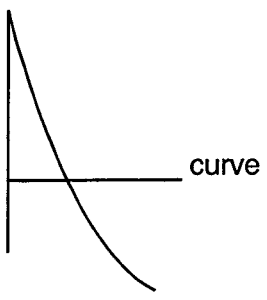
Question No.	SECTION A			Part Mark
6	$x = \frac{2.5}{1.7} \times 1.2$	M2	If zero scored: allow M1 for correct implicit form, but *not* as a ratio.	
	$= 1.76\ldots$ or 1.8	A1		3
7	for example:			
	(a) (i) $0.3333\ldots$	B1		
	$= \frac{1}{3}$	B2		3
	(ii) Non-recurring decimal	B2	Allow "Does not have a pattern" But *not* "Cannot be written as a fraction"	2
	(b) $\left[\sqrt{6\frac{1}{4}} \text{ is rational} = \right] \frac{5}{2}$ o.e.	B1	} Must be in the form $\frac{p}{q}$	
	$\left[(\frac{1}{3}\sqrt{3})^2 \text{ is rational} = \right] \frac{1}{3}$ o.e.	B1		
	$\sqrt{4\frac{1}{4}}$ and $\frac{1}{3} + \sqrt{3}$ are irrational	B1	Explicit. Not necessarily in answer space.	3
8	(a) (i) 2, 5, 11, 21, 33, 43, 47, 50 correctly plotted and joined	B2	*OR* Allow B1 for 4 or more pts correctly plotted. But BO if plotted at mid-intervals	2
	(ii) median $62 \rightarrow 64$	B1		
	IQR $20 \rightarrow 24$	B1		2
	(iii) Maths has *higher 'average'* (median) but *more spread out*	√ B1 √ B1	Allow "Medians similar" Must use "spread" *not* range Must follow from their (ii).	2
	(b) 0.6 o.e.	B1		
	$(1 - \text{'0.6'}) = \text{'0.4'}$	√ B1		
	$0.6 + \text{'0.4'} \times 0.7$	M1, M1	1st M: '0.4' × 0.7 identified 2nd M: + 0.6	
	$= \underline{0.88}$ o.e. *not* ratios	A1		5

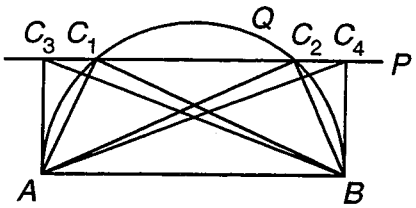
OR Alternative Method

0.4 B2

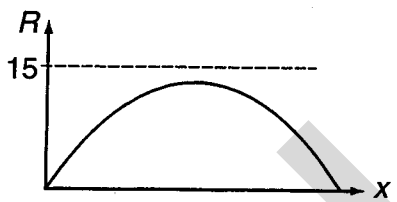
$1 - (0.4 \times 0.3)$ M2

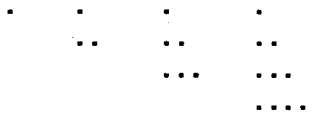
0.88 o.e. A1

Question No.	SECTION A			Part Mark
9	**(a)** 14, –2, –10, –14, –16	B3	*OR* B2 – three correct *OR* B1 – two correct	3
	(b) 	√P1 C1	within $\frac{1}{2}$ small square vertically. Allow first segment ruled. 'Reasonably' smooth.	2
		B1	Straight line with negative gradient	
	(c) st. line. Allow freehand.	B1 B1	Their graph thro' (0, 14) Their graph thro' (3, –16)	3
	(d) 2.6 → 2.8 mins or 2 min 36 sec → 2 m in 48 sec	B1	Allow for example 2 : 42 but *not* 2.42 unless identifies minutes and seconds	1
10	**(a)** $\left(\frac{23.5}{30}\right)^2$ or inverse o.e. or $23.5^2 : 30^2$ o.e.	M2	*If zero scored*: allow M1 for $\frac{23.5}{30}$ or inverse or 23.5 : 30 o.e. or 0.783 . . . . 1.276	
	= 0.61 . . . . : 1 or 1.62 . . . . or 1.63 : 1 seen	A1	*not* n = ... or 1 : n	3
	(b) $\left(\frac{23.5}{30}\right)^3$ o.e. or $23.5^3 : 30^3$ o.e.	M1		
	= 0.48 . . . . : 1 seen or 2.08 . . . . : 1 o.e. or 2.1 : 1	A1	*not* n = ... or 1 : n	2
	(c) Yes, approx. $\frac{1}{2}$ or double *or* No, not exactly . . . or . . .	√B1	follow thro' from **(b)** Must be a correct statement. If 2 : 1 in **(b)** without working, BO for **(c)**	1

Question No.	SECTION A			Part Mark
11			Condone loci dashed lines.	
	(a) Horiz. line 3 cm above *AB*	B2	Allow B1 for (freehand with) correct intention. e.g. 6 or more points	2
	(b) Semi-circle, centre mid-pt *AB* radius 4 cm	B3	Allow B1 for correct intention. e.g. part of semi-circle or series of points *OR* B2 for complete but freehand.	3
	(c) C_1 and C_2 C_3 and/or C_4	B1 B1	Must be complete triangles. Ignore extra triangles.	2
12	$\cos\theta = \frac{40^2 + 32^2 - 35^2}{2 \times 32 \times 40}$	M2	Allow M1 for other correct form.	
	= 56.9 or better or 57 seen	A1		
	Bearing = 303 or rounds to 303	√ A1	f.t. only after correct method.	4
13	**(a)** $5000 \times \pi \times 3.75^2 \times 11.15$ rounds to 2460000 seen	M1 A1	Allow 3.749... and 11.149...	
	(b) his (a) $\div \pi \times 3.65^2 \times 11.05$	M1		
	= 5325	A1 cao.	cao. WWW	2

Question No.	SECTION A			Part Mark
14	(a) (i) $x(x-3) = x-3+11$ *OR* $(x-1)(x-3) = 11$ o.e. $x^2-4x-8=0$	 M2 A1	arranging quadratic in this form *OR* correctly removing denominator validly obtained.	3
	(ii) $-1.2, -1.62, -1.38, -1.51, -1.44, -1.48, -1.46$ $= -1.5$	M1 A1	2 or more repeated substitutions validly, by checking last two values	2
	(b) (i) $\frac{4 \pm \sqrt{16+32}}{2}$	M1	correct substitution, unsimplified	
	$= -1.464$ or 5.464	A1 A1	allow correct roundings and $2+2\sqrt{3}$, $2-2\sqrt{3}$	3
	(ii) both give the negative solution to equn	B1	*no* follow through *except* -1.4 in (a)(ii)	1
15	$\sin\theta = \frac{\text{'11.2' sin '54'}}{\text{'12.6'}}$	M1	any 'correct' values sub. and formula rearranged.	
	$= \frac{11.15 \sin 53.5}{12.65}$	B1, B1 B1	top bottom. Allow 12.649...	
	$\theta = 45.12$ or rounds to 45.12	A1	For answers 45.1 or 45 LOOK BACK. Full marks if correct working seen.	5
16	(a) $\Sigma xf \div \Sigma f$ $\mu = 4.5$ $\Sigma x^2 f = 1185$ $\sigma = \sqrt{\frac{1185}{50} - 4.5^2}$	M1 A1 M1 M2	225 ÷ 50 	
	$\Sigma f(x-\bar{x})^2 = 172.5$ $\sqrt{\frac{\text{'172.5'}}{50}}$			
	$= 1.85 \rightarrow 1.9$	A1	WW correct answers score full marks.	6
	(b) Range '2.64 → 6.36' passes	M1	After MO allow	
	$3 \rightarrow 6 \Rightarrow 68\%$	A1, A1 cao.	SC1 for 34	3

Question No.	SECTION A			Part Mark
17	**(a) (i)**		Ignore obtuse angles.	
	x | 0 20 40 45 60 80 90 R | 0 9.3 14.2 14.4 12.5 4.9 0	B3	At least 5 values, spanning 45°, correctly evaluated to 1 dp. Suitable range of ~ 6 values *OR* Allow B1 1 or 2 values B2 3 or 4 values.	
	(ii)  	P2 C1	follow thro' 5 or more 'reasonably' correct Allow P1 for 3 or 4 'reasonably' correct must be a 'realistic' sine curve including a max. turning point.	
	(iii) As angle increases range increases then decreases Max. range at 45° At least 60 cm short of record	B1 B1 B1 B1	 or his maximum is 14.4 or cannot beat the record	10
	(b) Discovers one way in which record can be broken. eg $V = 13.2$, $x = 45$	M2 A1	Supported by calculation	
	Discovers a second way in which record can be broken. eg $V > 12.25$, $x = 45$ or $V = 13$, $x = 40$	M1 A1	*New V* which is < 13.2 used	5

Question No.	SECTION A			Part Mark
18	(a) (i) 1, 3, 6, 10, 15, 21	B2	generating 4 or more terms. Allow B1 for 2 or 3	
		B2	showing these are △ nos.	
	(ii) $\frac{n(n+1)}{2}=171$	M1	*OR* using any *complete*, alternative method.	
	$n^2+n-342=0$	M1		
	$n=\frac{-1\pm\sqrt{1+1368}}{2}$	M1		
	$n=18$	A1	choosing +ve value	8
	(b) (i) $1+3=2^2$ or 4 $3+6=3^2$ or 9	B2	showing at least two correct expressions	
	(ii) $\frac{n(n+1)}{2}+\frac{(n+1)(n+2)}{2}$ o.e.	M2	accept $(n+1+1)$	
	$=n^2+2n+1$	A2		
	$=(n+1)^2$	A1		7