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Cambridge International General Certificate of Secondary Education (9–1)

MATHEMATICS

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Paper 6 (Extended)

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MARK SCHEME

Maximum Mark: 96

Published

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Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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This document consists of **7** printed pages.

MARK SCHEME NOTES

The following notes are intended to aid interpretation of mark schemes in general, but individual mark schemes may include marks awarded for specific reasons outside the scope of these notes.

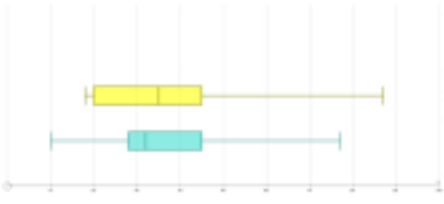
Types of mark

- M Method marks, awarded for a valid method applied to the problem.
- A Accuracy mark, awarded for a correct answer or intermediate step correctly obtained. For accuracy marks to be given, the associated Method mark must be earned or implied.
- B Mark for a correct result or statement independent of Method marks.

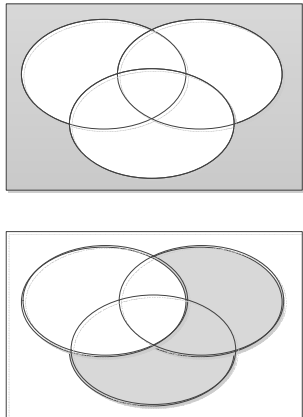
When a part of a question has two or more ‘method’ steps, the M marks are in principle independent unless the scheme specifically says otherwise; and similarly where there are several B marks allocated. The notation ‘**dep**’ is used to indicate that a particular M or B mark is dependent on an earlier mark in the scheme.

Abbreviations

awrt	answers which round to
cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
nfw	not from wrong working
oe	or equivalent
rot	rounded or truncated
SC	Special Case
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	30.6[4]	3	M2 for $(2 \times 29 + 26 \times 30 + 13 \times 31 + 6 \times 32 + 3 \times 33) \div 50$ or better soi or M1 for $2 \times 29 + 26 \times 30 + 13 \times 31 + 6 \times 32 + 3 \times 33$ soi
1(b)	A decision with correct supporting reason	1	
2(a)	1.5 oe	1	
2(b)	252	3	M2 for $\frac{12}{2}(25+17)$ oe or M1 for $\frac{1}{2} \times 8 \times 12$ or $12 \times (25-8)$
3(a)(i)	51.6 or 51.56[...] or 52	2	M1 for $3.3[\times 10^{23}] \div 6.4[\times 10^{23}]$ oe soi
3(a)(ii)	7.4×10^{22} or 7.36×10^{22} or $7.356[\dots] \times 10^{22}$	2	M1 for $6.4 \times 10^{23} \div 8.7$ oe or SC1 for answer figs 736 or 7356
3(b)	9×10^{56}	4	M3 for $\frac{3}{4} \times 2 \times 10^{30} \times 6 \times 10^{23} \times 1000$ or M2 for two correct stages or M1 for $2 \times 10^{30} \times 6 \times 10^{23}$ or $\frac{3}{4}$ or 1000 used correctly
4	13 650 to 675	7	M3 for $\frac{(15.3+11.7)10.1}{2} - \pi \times 1.45^2$ or M1 for $\frac{(15.3+11.7)10.1}{2}$ and M1 for $\pi \times 1.45^2$ M2 for <i>their</i> area $\times 70 \div 750$ or M1 for either $\times 70$ or $\div 750$ B1 for rounding <i>their</i> 12.1 to the integer above
5(a)	17	2	B1 for 45 or 28 seen
5(b)		3	B1 for Max = 85 and Min = 18 B1 for Median = 36 B1 for UQ = 52 and LQ = 20 Max 2 marks if box plot not complete

Question	Answer	Marks	Partial Marks
5(c)	Two (different) conclusions, one about 'average' and one about spread, supported by evidence	2	B1 for one conclusion supported by evidence Examples of valid conclusions include Class Q's results are <ul style="list-style-type: none"> • more spread out because IQR is greater • similarly spread out because range is same • better (generally) because median is higher • better (generally) because fewer weak and more good results
6(a)	[500 +] $500 \times 24 \times 0.012$	M1	
	500×1.01^{24}	M1	
	(<i>their</i> 644) – (<i>their</i> 634.87) oe	M1	Calculations must come from use of simple interest and compound interest
	9.132[...] or 9.133	A1	
6(b)	37	3	M1 for any correct trial with $n > 24$ M1 for improved correct trial with $n > 26$
7(a)(i)	Exterior angle clearly marked	1	
7(a)(ii)	30	3	M1 for $180 - 168$ M1 for $\frac{360}{\text{their } (180 - 168)}$ <u>Alternative method</u> M1 for $\frac{180(n - 2)}{n} = 168$ M1 for $12n = 360$ oe
7(b)(i)	Reflection symmetry not a valid reason or RHS not a valid conclusion	1	
7(b)(ii)	Lines 2 and 4 changed correctly	2	B1 for line 2 or line 4 correct
8(a)	Correct ruled line drawn from $(-1, -4)$ to $(3, 4)$	2	M1 for at least two correct points identified
8(b)(i)	$y = 3$ drawn broken line Correct region identified	2	B1 for each

Question	Answer	Marks	Partial Marks
8(b)(ii)	(1, 1), (1, 2), (2, 2)	2	B1 for one or two points correct and no extras or 3 points correct and one or more of (0, 3), (1, 3), (2, 3) or FT1 for at least 2 correct points in <i>their</i> region and none incorrect
9	$9x - 4 + 8x + 20 + 120 - x + 12x = 360$	M1	For Angle sum = 360
	$28x = 224$	M1	FT collecting x terms and numbers in their equation
	$x = 8$	A1	
	Attempting to show that at least one pair of opposite angles are supplementary	M1	Substitute <i>their</i> x into a pair of opposite angles and add
	State opposite angles in a cyclic quadrilateral are supplementary oe	B1	
10(a)(i)	35, 26, and 7 correctly placed	2	B1 for two numbers correct or for $n(P \cup R) = 73$
10(a)(ii)	61	1	
10(a)(iii)	$\frac{12}{38}$ isw	1	
10(b)		2	B1 for each
11(a)	$\frac{17x+12}{5(x+1)}$ or $\frac{17x+12}{5x+5}$ final answer		M1 for $5(3x+2) + 2(x+1)$ oe soi M1 for $5(x+1)$ oe as common denominator

Question	Answer	Marks	Partial Marks
11(b)	$8x \times 3x$ or $3y \times 2y$ or better	M1	
	$24x^2 - 6y^2$	A1	
	$6(4x^2 - y^2)$	B1	
	$6(2x + y)(2x - y)$	A1	A0 if any errors in working
11(c)	-4	3	M1 for $8^{\frac{1}{3}} = 2$ soi M1 for $2^4 = 16$ soi
12(a)	15.3 or 15.25 to 15.26	5	B1 for [$\angle PQR =$] 83° soi M2 $[RP^2] = 11^2 + 12^2 - 2 \times 11 \times 12 \times \cos(\text{their}83)$ or M1 if correct implicit cosine rule or explicit version with no more than one error A2 for 15.3 or 15.25 to 15.26 or A1FT for <i>their</i> 233 or 232.8[...]
12(b)	296 or 296.3 to 296.5	4	M2 for $\sin[] = \frac{11 \sin \text{their}83}{\text{their}15.3}$ or M1 if correct implicit sine rule or explicit version with no more than one error A1 for [PRQ] = 45.5 to 45.7 B1 for $360 - 18 - (\text{their } 45.7)$
13(a)	$(c, -d)$	2	B1 for one co-ordinate correct accept $\frac{p+r}{2}$ for c
13(b)	$x = c$ or $x = \frac{p+r}{2}$	1	FT <i>their</i> x co-ordinate
13(c)	$(x - p)(x - r)$	2	B1 for $(x \pm p)(x \pm r)$
13(d)	$x = c \pm \sqrt{d}$	3	M2 for $x - c = \pm \sqrt{d}$ or M1 for $x - c = \sqrt{d}$
	Explanation of why the minus is used for p	1	
13(e)	Correct explanation	1	

Question	Answer	Marks	Partial Marks
13(f)	pr	3	B2 for $x^2 - px - rx + pr$ B1 for either x term(s) or pr correct
13(g)(i)	Convincing explanation	1	
13(g)(ii)	9	2	M1 for $c = 1 + \sqrt{16}$ or better