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Paper 4 (Extended) **October/November 2017**

MARK SCHEME

Maximum Mark: 120

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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

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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
nfww	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)(i)	10	**1**	
1(a)(ii)	0.1	**1**	
1(b)	5	**2**	**M1** for g(5) = 0.2 oe
1(c)	0 and –4 nfww	**3**	**M1** for h(x) = 4 or $3(x+2)^2-2[=10]$ **B1** for $(x+2)^2=4$ oe or $3x^2+12x=0$ oe
1(d)	$\frac{1}{9x^2}$ or $\frac{1}{(3x)^2}$ oe final answer	**2**	**M1** for $(3x-2+2)^2$
2(a)	88, 181.5, 110	**5**	**B4** for any two correct or all three correct values seen OR **M1** for converting times to same units e.g. 160 : 330 : 200 **M2** for correct method to find any part e.g. $\frac{their\,160\,or\,330\,or\,200}{their\,690}\times 379.5$ oe or **M1** for correct use of total e.g. $\frac{379.5}{their\,690}$ soi 0.55 **A1** for any one value correct, correctly placed
2(b)(i)	66.69	**2**	**M1** for 70.2×0.95 oe
2(b)(ii)	65[.00] cao	**3**	**M2** for $\frac{70.2}{1.08}$ oe or **M1** for 70.2 = 108% soi
2(c)(i)	$450\times\frac{3.5}{100}[\times 5]$ or $5\times\frac{3.5}{100}[\times 450]$ or better	**M1**	
	$450+450\times 5\times\frac{3.5}{100}$ leading to 450 + 78.75 or better.	**A1**	i.e. full and correct conclusion to 450 + 78.75 [= 528.75]
2(c)(ii)	3.35 or 3.350…	**3**	**M2** for $\sqrt[5]{\frac{530.6}{450}}$ or **M1** for $450\times[\ ]^5=530.6$ oe
3(a)(i)	Points correctly plotted	**2**	**B1** for 2 or 3 correct points
3(a)(ii)	Negative	**1**	

Question	Answer	Marks	Partial Marks
3(b)(i)	8	**1**	
3(b)(ii)	18.3 or 18.33 or $18\frac{1}{3}$	**1**	
3(c)(i)	$y = 97[.0] - 9.84x$	**2**	or 97.02... and –9.836... **B1** for 97[.0] + kx, or $a - 9.84x$, If 0 scored **SC1** for $97 - 9.8x$
3(c)(ii)	21.2 to 21.3 or 21	**1**	Strict **FT** *their* (c)(i) provided a linear expression
4(a)	171 cao nfww	**3**	**B2** for 171.25 or 171.3 or **M2** for complete method with 1 numerical error or **M1** for at least 3 mid-pts (60, 135, 165, 195, 230, 275) soi
4(b)	$\frac{44}{595}$ cao	**3**	**B2** for $\frac{1056}{14280}$ oe accept 0.0739 or 0.07394 to 0.07395 or **M1** for $\frac{33}{120} \times \frac{32}{119}$
4(c)(i)	0.1, 0.9, 1.1, 0.5, 0.7, [0.1]	**2**	**B1** for 3 or 4 correct
4(c)(ii)	Correct histogram	**4**	**B1** for suitable scale **B1** for correct column widths **B1FT** for 4 or more correct heights
5(a)(i)	–6**p** + 6**q** oe	**1**	
5(a)(ii)	–2**p** + 2**q** oe	**2**	**FT** *their* (a)(i) ÷ 3 provided in form a**p** +b**q** **B1** for –2**p** + k**q** or for k**p** + 2**q** **M1** for $\overrightarrow{AD} = 2$**p** oe or $\overrightarrow{AE} = 2$**q** or correct route
5(a)(iii)	4**p** cao	**1**	
5(a)(iv)	–6**p** +2**q** oe	**2**	**B1** for –6**p** + k**q** or for k**p** + 2**q** **M1** for a correct route
5(b)(i)	216	**2**	**M1** for $\left(\frac{1}{3}\right)^2$ or 3^2 oe soi
5(b)(ii)	96	**3**	**M2** for $\left(\frac{1}{2}\right)^2$ or 2^2 oe soi or **M1** for triangle *EFC* is similar to triangle *EDA* soi

Question	Answer	Marks	Partial Marks
6(a)	192	2	**M1** for $\frac{1}{3}\times\left(\sqrt{72}\right)^2\times 8$ oe
	cm^3	1	
6(b)	12	2	**M1** for $(\sqrt{72})^2+(\sqrt{72})^2$ oe
6(c)	10	3	**M2** for $8^2+\left(0.5\,their\,(b)\right)^2$ or **M1** for **[***PD* oe =] $0.5\times$ *their* (b)
(d)	53.1 or 53.13	2	**M1** for $\tan=\frac{8}{0.5\times their(b)}$ or $\sin=\frac{8}{their(c)}$ or $\cos=\frac{0.5\times their(b)}{their(c)}$
6(e)(i)	$\sqrt{82}$ or 9.06 or 9.055...	3	**M2** for $8^2+(0.5\times\sqrt{72})^2$ or $(their\,(c))^2-(0.5\times\sqrt{72})^2$ or **M1** for $(0.5\times\sqrt{72})^2$
6(e)(ii)	62.1 or 62[.0] or 62.00 to 62.10	2	**M1** for $\tan=\frac{8}{0.5\times\sqrt{72}}$ oe
6(f)	4 cao	3	**M2** for $\sqrt[3]{\frac{24}{their\,(a)}}$ or $\sqrt[3]{\frac{their\,(a)}{24}}$ soi by 2 or $\frac{1}{2}$ or **M1** for $\frac{24}{their\,(a)}$ or $\frac{their\,(a)}{24}$ soi by 8 or $\frac{1}{8}$
7(a)	6810 or 6806 to 6808	3	**M2** for $\frac{1}{2}\times\frac{4}{3}\pi(15^3-5^3)$ or **M1** for either $[\frac{1}{2}\times]\frac{4}{3}\pi\times 15^3$ or $[\frac{1}{2}\times]\frac{4}{3}\pi\times 5^3$
7(b)	2200 or 2199…	5	**M4** for $2\times\pi\times5^2+2\times\pi\times15^2+\pi\times(15^2-5^2)$ or **M1** for each term
8(a)	(–1, 5)	2	**B1** for each
8(b)	(–1, –5)	2	**B1** for each
8(c)	Reflection *y*-axis oe	2	**B1** for each
9(a)(i)	Correct graph	2	**B1** for correct shape with a max

Question	Answer	Marks	Partial Marks
9(a)(ii)	(0, 10) (3.7[0], 0) or (3.701 to 3.702, 0)	**2**	**B1** for each
9(a)(iii)	3.54 or 3.541…	**1**	
9(b)(i)	Correct graph	**2**	**B1** for correct shape with a min
9(b)(ii)	(1.47, 0.488) or (1.473 to 1.474, 0.4877…)	**2**	**B1** for each
9(b)(iii)	0.0982 or 0.09819 to 0.09820 and 2.98 or 2.975 or 2.976	**2**	**B1** for each
9(b)(iv)	1.1[0] or 1.098… 3.98 or 3.975 to 3.976	**2**	**FT** *their* (iii) + 1 **B1** for each
10(a)	appropriate sketch giving one positive and one negative answer or fully correct use of formula	**M2**	**M1** for sketch of parabola or parabola and straight line or $\sqrt{3^2-4(4)(-12)}$ or $\frac{-3\pm\sqrt{.....}}{2(4)}$ oe
	1.4[0] and –2.15 final answers	**B2**	**B1** for each If 0 scored **B1** for 1.397… and –2.147... or **SC1** for 2.15 and –1.4[0]
10(b)	$x > 1.40$ and $x < -2.15$	**2**	**FT** $[x] > \textit{their}$ max(a), $[x] < \textit{their}$ min(a) **B1** for each
10(c)	$-1.75 \leqslant x \leqslant 1$ nfww	**4**	**B3** for 1, -1.75 oe **B2** for 1 inequality correct **B1** for 1 correct value seen or **M2** for appropriate sketch or correct factorising or correct use of formula or **M1** for $4x^2 + 3x - 7 \leqslant 0$
11(a)	[x =] 5 [y =] 2 with correct working	**4**	**M1** for correctly equating one set of coefficients **M1** for correct method to eliminate one variable OR **M1** for equation $x =$ or $y =$ from one equation **M1** for correct substitution into other equation **B1** for $x = 5$ **B1** for $y = 2$ If zero scored **SC1** for correct subst into one of original equs and evaluation to find other variable
10(b)	[a =] 10 [b =] 4	**2**	**B1** for each **FT** *their* (a) × 2

Question	Answer	Marks	Partial Marks
10(c)(i)	[p =] log 5 and [q =] log 2 Final answers	**3**	**B2 FT** *their* (a) for either seen or **B1 FT** for each correct decimal answer 0.699 or 0.6989 to 0.6990 0.301 or 0.3010... or **M1** for $10^{p} = their\,5$ or $10^{q} = their\,2$
10(c)(ii)	1 cao	**1**	