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CAMBRIDGE INTERNATIONAL MATHEMATICS

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Paper 4 (Extended)

October/November 2016

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.

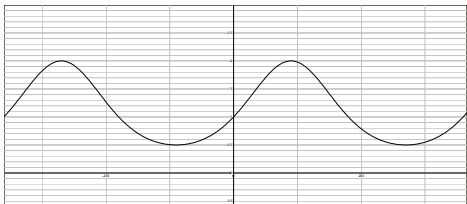
Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

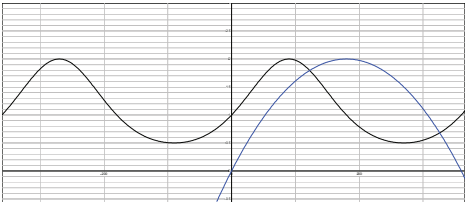
Cambridge will not enter into discussions about these mark schemes.

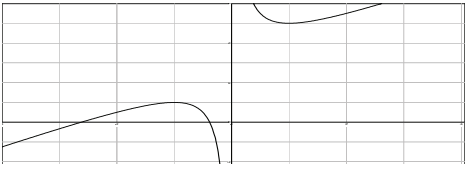
Cambridge is publishing the mark schemes for the October/November 2016 series for most Cambridge IGCSE[®], Cambridge International A and AS Level components and some Cambridge O Level components.

Abbreviations

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

Qu.	Answer	Mark	Part Marks
1	(a)	201	M1 for $2500 \div 12.43$ (implied by 201.1...)
	(b) (i)	783 or 782.5 to 783.3....	B1 for 10h 40min oe 10.66..., 10.67, $10\frac{2}{3}$, 640 M1 for $8350 \div$ <i>their</i> journey time
		(ii)	[0]8 05 oe
	(iii)	7	3 M2 for $(36.8 - 20) \div 2.4$ oe or M1 for $20 + 2.4 \times$ distance = 36.8 oe
2	(a) (i)	$\begin{pmatrix} -8 \\ -5 \end{pmatrix}$	1
	(ii)	Image at (-4, -1), (2, -1), (2, 3)	2FT SC1FT for translation $\begin{pmatrix} -8 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -5 \end{pmatrix}$
	(iii)	9.43 or 9.433 to 9.434	2 M1 for $(\text{their}(-8))^2 + (\text{their}(-5))^2$ oe
	(b) (i)	Reflection y-axis oe	1 1
		(ii)	Enlargement 0.5 oe (10, -10)
	(iii)	Stretch [factor] 0.25 oe x-axis oe invariant	1 1 1
3	(a)	Correct sketch 	3 B1 for shape including 2 minimum points and 2 maximum points B1 for all above x-axis
	(b)	$0.5 \leq f(x) \leq 2$	2 Allow written separately or in words B1 for each SC1 for $0.5 \leq x \leq 2$

Qu.	Answer	Mark	Part Marks
(c) (i)	1	1	
(ii)	2	1	
(d) (i)	-90, 270, 630, 990	2	B1 for -90 and 270 with no others from -360 to 360
(ii)	$360n - 450$ oe	2FT	FT only if clear linear sequence B1FT for $360n + k$ or $kn - 450$
(e) (i)	Correct sketch 	2	B1 for parabola vertex upwards
(ii)	122.4 or 122 or 122.4... 326.2 or 326 or 326.2...	1 1	
4 (a)	$\frac{2}{3}\pi \times 9^3$ $\frac{3}{1}\pi \times 9^2$ or equation with parts clearly cancelled leaving 2 and 9	M2	M1 for $\frac{1}{3}\pi \times 9^2 \times h = \frac{2}{3}\pi \times 9^3$ oe
(b) (i)	763 or 764 or 763.4 to 763.5...	2	M1 for $\pi \times 9^2 + 2\pi \times 9^2$ or SC1 for 509 or 508.9 to 509.0... or 162π
(ii)	569 or 569.0 to 569.1	3	M2 for $\pi \times 9 \times \sqrt{9^2 + 18^2}$ or M1 for $9^2 + 18^2$
(c)	45	3	M2 for $\frac{2}{3}\pi \times 9^3$ $\frac{4}{3}\pi \times 2^3$ or equation with parts clearly cancelled (implied by 45.56 to 46) or M1 for $\frac{4}{3}\pi \times 2^3 \times n = \frac{2}{3}\pi \times 9^3$
5 (a)	$18 - x + x + 12 - x + 3 = 25$ oe Completion to $x = 8$ with at least one step	M1 A1	B1 for Venn diagram completed with the 10, 8, 4 and 3
(b) (i)	$\frac{22}{25}$ oe	1	0.88
(ii)	$\frac{21}{25}$ oe	1	0.84

Qu.	Answer	Mark	Part Marks
(c)	$\frac{8}{18}$ oe	1	$\frac{4}{9}$, 0.4444...
(d)	element chosen from Q is also in P oe	1	
6 (a)	$y = \frac{2}{3}x + \frac{5}{3}$ oe	5	B1 for (2, 3) seen B1 for gradient of $AB = -\frac{3}{2}$ B1FT for gradient = $\frac{2}{3}$ M1 for correct method in finding c .
(b)	$1\frac{1}{3}$ oe	2	FT 3 – their $\frac{5}{3}$ in (a) (but not if 0) M1 for 3 – their $\frac{5}{3}$ in (a)
7 (a)	42.[0] or 41.98 to 41.99	2	M1 for $\tan = \frac{9}{10}$ oe
(b)	$\tan = \frac{\sqrt{9^2 + 10^2}}{20}$ oe 33.91 to 33.93	M2 A1	or M1 for $\sqrt{9^2 + 10^2}$ or $\sqrt{9^2 + 10^2 + 20^2}$
(c)	12.4 or 12.39 to 12.40... nfw	3	M1 for $20^2 + 22^2 - 2 \times 20 \times 22 \cos 33.9$ A1 for 153 to 154
8 (a)	Correct sketch 	2	B1 for one correct branch
(b)	-2.62 or -2.618... -0.382 or -0.3820 to -0.3819	1 1	If 0 scored, M1 for correct use of quadratic formula oe
(c)	$x < -2.62$ $-0.382 < x < 0$	1FT 2FT	FT only if 2 negative roots in (b) FT only if 2 negative roots in (b) B1 each
(d)	$[a =] 0$ $[b =] 3$	1 1	
(e)	Translation $\begin{pmatrix} 0 \\ -3 \end{pmatrix}$ oe	1 1	

Qu.	Answer	Mark	Part Marks
9	(a) 18, 20, 15, 20, 20	3	B2 for 4 correct B1 for 3 correct
	(b) 3.3[0] or 3.295 to 3.296	2FT	M1 for at least 3 mid-values seen, 0.5, 1.5, 2.5, 4, 7.5 If 0 scored, SC1 for 2.26 or 2.258... or for 4.33 or 4.333... or 4.3
	(c) 0.649 cao	2	M1 for $\frac{\text{their75}}{\text{their93}} \times \frac{\text{their74}}{\text{their92}}$ (implied by $\frac{5550}{8556}$ or 0.6486 to 0.6487 oe)
10	(a) $\frac{9}{7}$ oe	2	M1 for $7x = 11 - 2$ oe
	(b) $\frac{5x+1}{6}$ final answer	2	M1 for $3(x+1) + 2(x-1)$ seen
	(c) (i) $\frac{2x}{y^2}$ final answer	2	B1 for 2 terms correct
	(ii) $\frac{x+3}{x+1}$ final answer	4	B1 for $(x-3)(x+3)$ B2 for $(x-3)(x+1)$ or or SC1 for $(x+a)(x+b)$ where $ab = -3$ or $a+b = -2$
11	(a) 2	2	B1 for $[f(33) =] 100$ or M1 for $\log(3x+1)$
	(b) $\frac{1}{100}$ or [0].01	2	M1 for $g(x) = 3(-1) + 1$ oe
	(c) (i) $\frac{x-1}{3}$ oe	2	M1 for $x = 3y + 1$ or $y - 1 = 3x$
	(ii) 10^x	2	M1 for $x = \log y$ or $10^y = x$
12	(a) (i) 12	3	M2 for $\frac{1540-1375}{1375} \times 100$ oe or M1 for $\frac{1540}{1375} \times 100$ or for $\frac{1540-1375}{1375}$
	(ii) 89.3 or 89.28 to 89.29	1	
	(iii) 1250	3	M2 for $1375 \div 1.1$ oe or M1 for associating 1375 with 110%

Qu.	Answer	Mark	Part Marks
(b) (i)	$500 + \frac{500 \times 3 \times 5}{100}$ oe 500×1.025^5	M2 and M1	or M1 for $\frac{500 \times 3 \times 5}{100}$ oe (575, 565.704...)
	$500 \times 1.025^5 - 500$ $\frac{500 \times 3 \times 5}{100}$ amount – amount or interest – interest 9.3[0] or 9.295 to 9.296	M2 and M1 M1	or M1 for 500×1.025^5 (65.704..., 75)
(ii)	16	4	B3 for final answer of 15 or 15.28 to 15.29 seen or 15 reached by trial and improvement or M2 for sketch leading to answer or trial and improvement with at least two steps beyond 5 years or M1 for $500 + \frac{500 \times 3 \times x}{100} = 500 \times 1.025^x$ oe , implied by one trial