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CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/31**

Paper 3 (Core) **May/June 2016**

MARK SCHEME

Maximum Mark: 96

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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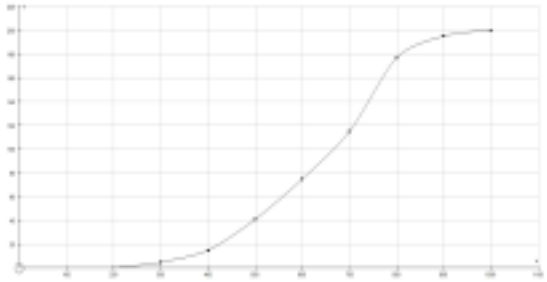
Abbreviations

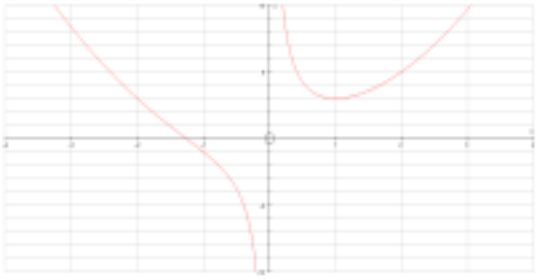
awrt answers which round to
cao correct answer only
dep dependent
FT follow through after error
isw ignore subsequent working
oe or equivalent
SC Special Case
nfww not from wrong working
soi seen or implied

Question	Answer	Mark	Part Marks
1 (a) (i)	356.3	**1**	
(ii)	360	**1**	
(iii)	400	**1**	
(iv)	$3.56[31] \times 10^2$	**1**	
(b) (i)	279.14	**1**	
(ii) (a)	20.86	**1FT**	**FT** 300 – *their* (b)(i)
(b)	7.47 or 7.472 to 7.473	**1FT**	**FT** *their* (b)(ii) ÷ *their* (b)(i) × 100
2 (a) (i)	4^6	**1**	
(ii)	4096	**1**	
(b) (i)	272	**1**	
(ii)	255	**1**	
(c)	4^8	**1**	
3 (a)	27	**1**	
(b)	10	**1**	
(c) (i)	50	**1**	
(ii)	23	**1 FT**	**FT** *their* 50 – *their* 27
(d)	$\frac{1}{20}$	**2**	**B1 FT** for $\frac{\textit{their}\,23}{460}$

Question	Answer	Mark	Part Marks
4 (a)	<table><tr><td>26</td><td>27</td><td>28</td><td>29</td><td>30</td><td>31</td><td>32</td><td>33</td><td>34</td></tr><tr><td>1</td><td>1</td><td>5</td><td>4</td><td>1</td><td>1</td><td>2</td><td>4</td><td>1</td></tr></table>	**2**	**B1** for 4 correct entries
(b) (i)	8	**1**	
(ii)	28	**1**	
(iii)	29	**1**	
(iv)	30	**1**	
(c) (i)	$\frac{4}{20}$ oe isw	**1FT**	**FT** $\frac{their 4}{20}$
(ii)	$\frac{11}{20}$ oe isw	**1FT**	**FT** $\frac{2+their 5+their 4}{20}$
5 (a) (i)	1	**2**	**M1** for $5\times2-2\times3-\frac{1}{2}\times6$ or better
(ii)	3.2	**3**	**M2** for $5B = 12 + 2 + 2$ or better (Allow 1 sign error e.g. $-5B$) or **M1** for $12 = 5B - 2(1) - \frac{1}{2}(4)$ or better
(b)	–13	**2**	**M1** for $7 \times -3 - 4 \times -2$ or better
(c)	$\frac{2y+9}{3}$ oe final answer	**2**	**M1** for correct first step
(d)	6 kiwi – 2 kiwi = 840 – 480 oe kiwi =90 pomegranate + 2 × *their* 90 = 480 oe pomegranate = 300	**M1** **A1** **M1** **A1 FT**	OR **M1** for setting up two equations **M1** for eliminating one variable **A1** kiwi = 90 **A1** pomegranate = 300 second **A1** is **FT** If no working shown **SC1** for both answers correct
6 (a)	144	**2**	**M1** for $\frac{12}{30}[\times360]$ seen or 48×3 or $\frac{60}{5}\times12$
(b)	Fully correct answer	**3**	**B2** for correct sectors but no labels or **B1** for 1 correct sector or **B1**for correct 3 labels according to size

Question	Answer	Mark	Part Marks
7 (a) (i)	75	**1**	
(ii)	105	**1**	
(b)	[p =] 70	**1**	
	[q =] 20	**1**	
	[r =] 20	**1FT**	**FT** *their q* or 90 – *their p*
	[s =] 140	**1FT**	**FT** 70 + *their p* or 180 – 2 × *their r*
8 (a) (i)	1.61 or 1.606 to 1.607	**2**	**M1** for $\sin 40 = \frac{BC}{2.5}$ or better
(ii)	4.11 or 4.106 to 4.107	**1FT**	**FT** 2.5 + *their* (a)(i)
(b)	1.92 or 1.915…	**2**	**M1** for $\cos 40 = \frac{HB}{2.5}$ or better or **M1** for 2.5^2 – *their* 1.61^2
(c)	1.02 or 1.016 or 1.02 to 1.03	**1FT**	**FT** 2 × *their* (a)(i) + *their* (b) – *their* (a)(ii)
9 (a)	Correct points plotted (2, 3) and (5, 7)	**2**	**B1** for each correct point
(b)	(3.5, 5)	**1**	
(c)	$\frac{4}{3}$	**2**	**M1** for $\frac{rise}{run}$ or **B1** for 1.3
(d)	$y = \frac{4}{3}x + 4$ oe final answer	**2 FT**	**FT** $y = their(c)\ x + 4$ oe **B1** for $y = their\frac{4}{3}x + k$ or $y = kx + 4$
10 (a) (i)	47.1 or 47.12 to 47.13	**1**	
(ii)	565 to 566	**1 FT**	**FT** *their* (a)(i) × 12
(b)	720	**1**	
(c)	154 to 155	**1 FT**	**FT** *their* (b) – *their* (a)(ii)
(d)	21.39 to 21.53	**1 FT**	**FT** *their* (c) ÷ *their* (b) × 100

Question	Answer	Mark	Part Marks
11 (a)	(0, 2), (–1, 1), (–2, 1), (–3, 2), (–2, 3)	**1**	
(b)	(2, –4), (3, –5), (4, –5), (5, –4), (4, –3)	**2**	**B1** for translation of $\begin{pmatrix} k \\ -6 \end{pmatrix}$ or $\begin{pmatrix} 2 \\ k \end{pmatrix}$ or **B1** for $\begin{pmatrix} -6 \\ 2 \end{pmatrix}$
(c)	(0, 6), (3, 3), (6, 3), (9, 6), (6, 9)	**2**	**B1** for any enlargement centre (0, 0) or correct shape, wrong position
(d)	3 : 1	**1**	
(e)	similar	**1**	
12 (a)	$700 \left[\leqslant x < \right] 800$	**1**	
(b) (i)	$\frac{(200+300)}{2} \left[= 250\right]$ oe	**1**	
(ii)	638.5	**2**	**M1** for multiplying midpoints by frequencies (and adding) – implied by 127700
(c)	$x < 300$: 5 $x < 400$: 15 $x < 500$: 41 $x < 600$: 75 $x < 700$: 115 $x < 800$: 177 $x < 900$: 195 $x < 1000$: 200	**2**	**B1FT** for 2 correct entries
(d)	Fully correct curve or ruled polygon 	**3FT**	**FT** only if increasing **B2FT** for *their* 4 or 5 points plotted correctly or **B1FT** for *their* 3 points plotted correctly

Question	Answer	Mark	Part Marks
(e) (i)	662 (660 to 680)	1FT	**FT** as long as it is an increasing curve
(ii)	230 (230 to 260)	2FT	**B1** for one correct quartile seen $(756 \pm 5$ or $526 \pm 5)$ **FT** as long as it is an increasing curve
(iii)	12 (8 to 16)	2FT	**B1** for 188 ± 4 seen or **M1** for clear method seen on graph **FT** as long as it is an increasing curve
13 (a)	Fully correct sketch 	4	**B1** for minimum in first quadrant **B1** for crossing x-axis approximately between –1 and –2 **B1** for not crossing y-axis **B1** for correct overall shape
(b)	$x = 0$	1	
(c)	(1, 3)	1	
(d)	3	1FT	**FT** *their* graph