

MARK SCHEME for the October/November 2013 series

4024 MATHEMATICS (SYLLABUS D)

4024/12

Paper 1, maximum raw mark 80

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.

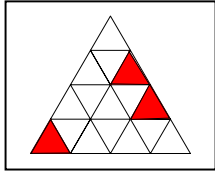
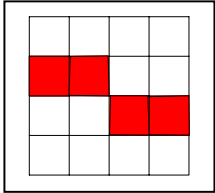
Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2013 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

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Abbreviations

cao	correct answer only
cso	correct solution only
dep	dependent
ft	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
www	without wrong working
soi	seen or implied

Question	Answers	Mark	Part marks
1 (a)	2.38 oe	1	
(b)	80 (.0)(0)	1	
2 (a)	$1\frac{9}{20}$	1	
(b)	0.0602	1	
3 (a)	-7	1	
(b)	$\frac{x+6}{2}$ oe	1	
4 (a)	(0)3 hours 48 minutes	1	
(b)	$\frac{2}{5}$ 44% $\frac{4}{9}$	1	
5 (a)		1	
(b)		1	
6	8	2	B1 for “k” = 40 or M1 either for $20 \times 2 = 5y$ oe; or for (their k)/5, when $y = “k”/x$ used
7 (a)	3.5×10^7	1	
(b)	1.4×10^{-6}	1	
8	$\frac{3}{7}$	2	B1 for $7x = c$, or for $\frac{7x}{c} = C$, or for $cx = 3C$; where c and C are integers (not 0).

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9	200	2	Dep. on three correct approximations seen. B1 for either $\sqrt{35.78} \approx 6$, or $\sqrt[3]{1005} \approx 10$
10	Any number between 4 and 5	2	B1 for $x < 5$, or for $5 > x$ seen. This may appear as, e.g., $4 < x < 5$.
11 (a)	45.5°	1	C1 for $151 < x \leq 151.2$ or M1 for $360 - 46.5 - 162.5$ or M1 for $360 - 46 - 162 - 1$
(b)	151°	2	
12 (a)	$\frac{9}{25}$	1	
(b)	$\frac{3}{t^3}$ or $3t^{-3}$	1	
(c)	$\frac{x^2}{3y}$ or $\frac{1}{3}x^2y^{-1}$	1	
13	Both $x = \frac{1}{2}$ and $y = -4$	3	C2 for either x or y correct WWW or C1 for a pair of values that satisfy either equation
14 (a)	1.35	1	
(b)	1.1	1	
(c)	104	1	
15 (a)	B C D	1	
(b)	E	1	
(c)	$y < \frac{1}{2}x$ oe	1	

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16	76	3	<p>Dep. on volume expressions in terms of a^3.</p> <p>C2 for $76a$, or $76a^2$, or $76(\pi)a^3$, or $\frac{76}{a}$, or $\frac{76}{a^2}$, or $\frac{76}{a^3}$</p> <p>B1 for a 3-spheres volume of $\frac{4}{3}\pi \times (2a)^3 \times 3$ or $32\pi a^3$</p> <p>and B1 for a cylinder volume of $\pi \times (3a)^2 \times 12a$ or $108\pi a^3$;</p> <p>or B1 for both $108\pi\dots$ and $32\pi\dots$ without a^3.</p>
17 (a)	$(5t - 2)(5t + 2)$	1	<p>B1 for partial factorisation $4x(2y + 1)$ or $-3(2y + 1)$ or $2y(4x - 3)$ seen</p>
(b)	$2r^2(3H - h)$	1	
(c)	$(4x - 3)(2y + 1)$	2	
18 (a)	16	1	
(b)	Rectangle, base 2 to 3, height 6 units Rectangle, base 7 to 9, height 2 units	1 1	
(c)	ft $\frac{15}{31 + \text{their}(p)}$	1 \checkmark	
19 (a)	(2, 1)	1	<p>C1 for $(\sqrt{\quad}) 52$</p> <p>or M1 for $6^2 + (-4)^2$, or for $6^2 + (4)^2$, etc.</p>
(b)	$-\frac{2}{3}$ or any equiv. value	1	
(c)	13	2	

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20	(a)	Reflection $y = x$ oe	1 1	but lost if more than one transf. named indep. – but lost if more than one transf. named																																																	
	(b) (i)	Triangle with vertices $(-1, 0), (-3, 0), (-3, 1)$	1																																																		
	(ii)	$\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$	1																																																		
21	(a)	1	1	<p>M1 for $\frac{3}{6} \times \frac{2}{5} \times \frac{2}{6} \times \frac{1}{5}$ oe</p> <p>or for any complete possibility diagram such as the one below, correctly used.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td>2</td> <td>3</td> <td>3</td> <td>4</td> <td>4</td> <td>4</td> </tr> <tr> <td>2</td> <td>–</td> <td>23</td> <td>23</td> <td>24</td> <td>24</td> <td>24</td> </tr> <tr> <td>3</td> <td>32</td> <td>–</td> <td>33</td> <td>34</td> <td>34</td> <td>34</td> </tr> <tr> <td>3</td> <td>32</td> <td>33</td> <td>–</td> <td>34</td> <td>34</td> <td>34</td> </tr> <tr> <td>4</td> <td>42</td> <td>43</td> <td>43</td> <td>–</td> <td>44</td> <td>44</td> </tr> <tr> <td>4</td> <td>42</td> <td>43</td> <td>43</td> <td>44</td> <td>–</td> <td>44</td> </tr> <tr> <td>4</td> <td>42</td> <td>43</td> <td>43</td> <td>44</td> <td>44</td> <td>–</td> </tr> </table>		2	3	3	4	4	4	2	–	23	23	24	24	24	3	32	–	33	34	34	34	3	32	33	–	34	34	34	4	42	43	43	–	44	44	4	42	43	43	44	–	44	4	42	43	43	44	44	–
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(b)	$\frac{1}{15}$	1																																																			
(c)	$\frac{4}{15}$	2																																																			
22	(a)	48°	1																																																		
	(b)	66°	1																																																		
	(c)	24°	1																																																		
	(d)	35°	1																																																		
23	(a)	$15^2 - 1^2 = 8 \times (1 + 2 + 3 + 4 + 5 + 6 + 7)$	1																																																		
	(b)	$(2n + 1)^2 - 1^2$ oe	1																																																		
	(c)	$(2n + 1)^2 = 4n^2 + 4n + 1$ or $(2n + 1)^2 - 1^2 = 4n^2 + 4n$, or $(2n)(2n + 2)$	B1																																																		
		Division of both sides by 8 and result obtained correctly	M1																																																		
24	(a)	96° to 98°	1	dep.on both (b) marks																																																	
	(b) (i)	acceptable perpendicular bisector of AB	1																																																		
	(ii)	acceptable bisector of angle ABC	1																																																		
	(c)	10 to 10.3	1																																																		

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25 (a)	16	1	
(b)	150	1	
(c)	45 WWW or ft $\frac{750 - \text{their}(b)}{20} + 15$	2 $\frac{1}{2}$	C1 for $\frac{750 - \text{their}(b)}{20}$ or M1 for $\frac{1}{2} \times (k + k - 15) \times 20 = 750$ or M1 for $20(k - 15) + \text{their}(b) = 750$ oe
(d)	10	1	
26 (a)	Establishing, with reasons, that two pairs of angles are equal; and a conclusion (or an introductory statement), that the triangles are similar. e.g. $\hat{A}BD = \hat{B}DC$ (alternate angles) $\hat{A}DB = \hat{B}CD$ (given) Since two angles are equal, triangles ABD and BDC are similar.	2	B1 for $\hat{A}BD = \hat{B}DC$, with mention of alternate angles
(b) (i)	6.3	2	B1 for $\frac{BC}{4.2} = \frac{6}{4}$ oe
(ii)	$\frac{4}{9}$	1	