

**MARK SCHEME for the May/June 2013 series**

**0607 CAMBRIDGE INTERNATIONAL MATHEMATICS**

**0607/42**

Paper 4 (Extended), maximum raw mark 120

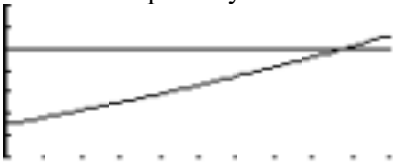
This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began,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

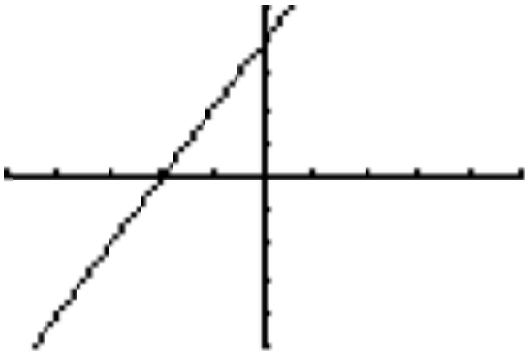
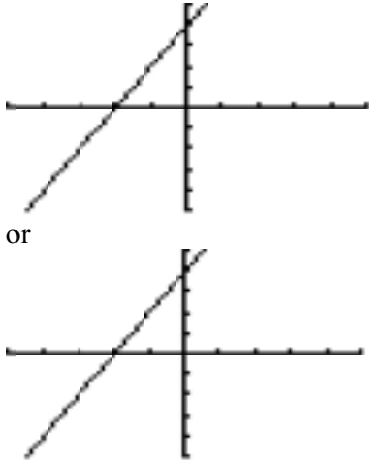
Cambridge will not enter into discussions about these mark schemes.

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

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<p><b>1 (a) (i)</b> 27.2 (27.22...)</p> <p><b>(ii)</b> 49 : 45 final answer</p> <p><b>(iii)</b> 500</p> <p><b>(iv)</b> 748.8[0] cao final answer</p> <p><b>(b)</b> 9 or 8.83 (8.829 to 8.830)</p>		<p><b>1</b></p> <p><b>2</b></p> <p><b>3</b></p> <p><b>2</b></p> <p><b>3</b></p>	<p><b>SC1</b> for answer 45:49 or 1.09 (1.088 to 1.089) or <b>B1</b> for 180 seen (may be implied by their ratio answer) or 27.2 (27.22..) : 25 o.e.</p> <p><b>M2</b> for <math>720 \div 1.44</math> o.e. or <b>M1</b> for <math>720 = 144\%</math> seen</p> <p><b>M1</b> for <math>720 \times 1.04</math> o.e. implied by 749. <math>\div 12</math> does not spoil method</p> <p><b>SC2</b> for answer 8.85  <b>M2</b> for <math>\log(1000/650) \div \log(1.05)</math>  Allow 1.54 for 1000/650 in methods.  or <b>M1</b> for <math>650 \times 1.05^n = 1000</math>  or 650 multiplied by 1.05 at least twice correctly</p>  <p><b>M2</b> for graphs that intersect as shown  or <b>M1</b> for graph of <math>y = 1.05^x</math></p>
<p><b>2 (a)</b></p> <p><math>2x(2x+1) = 3x(x+3)</math> o.e.</p> <p>7</p> <p><b>(b)</b></p> <p><math>\frac{2y}{y+1} = \frac{1}{3}</math></p> <p><math>3 \times 2y = y + 1</math> o.e. or better</p> <p><math>\frac{1}{5}</math> o.e.</p>		<p><b>M2</b></p> <p><b>B2</b></p> <p><b>M1</b></p> <p><b>B1</b></p> <p><b>B1</b></p>	<p>If <b>M0</b>, <b>B1</b> for <math>2x(2x+1)</math> or <math>3x(x+3)</math> Condone missing brackets if correct expansions follow</p> <p><b>B1</b> for <math>x^2 = 7x</math> o.e. or <math>2(2x+1) = 3(x+3)</math> o.e. or final answer 0, 7</p> <p>i.e correct equation without fractions leading to <math>y = \frac{1}{5}</math></p>


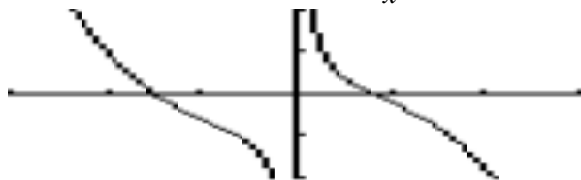
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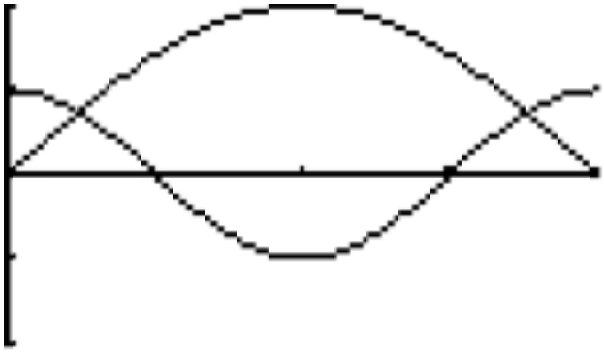
<p>(c) (i)</p> <p><math>\frac{10}{w}</math> soi</p> <p><math>\frac{10}{w+9}</math> soi</p> <p><math>2 \times 10(w+9) - 2 \times 10w = 5w(w+9)</math> o.e. or better</p> <p>or</p> <p><math>\frac{90}{w(w+9)} = 2\frac{1}{2}</math> o.e.</p> <p><math>w^2 + 9w - 36 = 0</math></p> <p>(ii) 3 h 20 min www</p>		<p><b>B1</b></p> <p><b>B1</b></p> <p><b>M1</b></p> <p><b>E1</b></p> <p><b>4</b></p>	<p>If not seen only implied by further working. e.g. <math>w \times 10 = 10</math> is not sufficient.</p> <p>i.e. correct multiplication of an equation in the correct format allow <math>10(w+9) - 10w = 2.5w(w+9)</math> o.e. also allow over common denominator i.e. correct collection of two terms</p> <p>Established with at least one more intermediate line with no errors or omissions</p> <p><b>B3</b> for <math>w = 3</math> or for <math>w = 3</math> or <math>-12</math> www <b>M2</b> for <math>(w+12)(w-3)</math> or good sketch of quadratic showing zeros or quadratic formula or completing square reaching <math>\frac{-9 \pm \sqrt{225}}{2}</math> or <b>M1</b> for <math>(w+a)(w+b)</math> with <math>ab = -36</math> or <math>a+b = 9</math> or sketch of quadratic or correct substitutions in quadratic formula before simplifying or <math>(w + \frac{9}{2})^2 - \frac{81}{4} = 36</math> o.e. Trial and improvement – allow <b>M2</b> for at least 3 trials for comparison of distances and times (unless correct answer found with 1 or 2 trials) <b>B1 FT</b> for <math>10 \div</math> their positive root correctly into hours and minutes</p>
<p>3 (a)</p> <p>(b) (i)</p> <p>(ii)</p>	<p><math>y = -x - 1</math> o.e. final answer</p> <p>Ruled line through <math>(-2, 0)</math> and <math>(0, 4)</math></p> 	<p><b>2</b></p> <p><b>2</b></p> <p><b>2FT</b></p>	<p><b>B1</b> for <math>y = -x + c</math> o.e. or <math>y = kx - 1</math> o.e. seen</p> <p><b>B1</b> for ruled line through <math>(0, 4)</math> or gradient of 2</p> <p><b>B1</b> for</p>  <p>or</p> <p>or tiny part not shaded <b>FT</b> only if positive gradient and cuts <math>x</math>-axis <b>SC1</b> for correct area unshaded</p>

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(c)	$y = 3x - 7$ o.e.	3	<b>B2</b> for $y = 3x + c$ o.e. or $y = kx - 7$ o.e. or <b>M1</b> for rise/run = $\frac{2-4}{3-1}$ o.e. and <b>M1</b> for correct method for finding $c$ Answer $3x - 7$ implies <b>M1 M1</b>
4 (a)	125.7 or 126	2	<b>M1</b> if at least 2 mid-values seen (60, 125 and 195) or 2 from 1680, 5625, 5265 or sum of 12570
(b)	Columns from 100 to 150 and 150 to 240 Heights 0.9 and 0.3	1 1,1	Accept freehand
5 (a)	534.6...                                  www 3	3	<b>M1</b> for $988^2 + 1060^2 - 2 \times 988 \times 1060 \cos 30$ <b>A1</b> for 285800 to 285802 or 286000
(b)	$[\cos =] \frac{1185^2 + 998^2 - 535^2}{2 \times 1185 \times 998}$ 26.6 (26.62 to 26.65)	<b>M2</b> <b>A1</b>	Allow use of 534.6... for 535 <b>M1</b> for correct implicit statement <b>Strictly dependent on at least M1</b> <b>SC2</b> if correct without working
(c)	353 (353.3 to 353.4)	<b>1FT</b>	<b>FT 380</b> – <i>their</i> (b) <b>only</b> if answer between 270 and 360.
6 (a)	720	2	<b>M1</b> for $0.5 \times 12 \times 6 \times 20$ o.e.
(b) (i)	700 (700.2 to 700.4)	4	Allow $432 + 120\sqrt{5}$ as final answer for full marks <b>M1</b> for $[BC^2] = 12^2 + 6^2$ <b>M2</b> for $BC \times 20 + 12 \times 20 + 6 \times 20 + 2 \times \text{area triangle } ABC$ or <b>M1</b> if one of the five areas missing or is incorrect
(ii)	3.5[0] (3.501 to 3.502)	<b>1FT</b>	<b>FT</b> <i>their</i> (i) $\times 0.005$
(c)	14.4 (14.42 to 14.43)	3	<b>M1</b> for $20^2 + 12^2$ (544) or $20^2 + 12^2 + 6^2$ (580) (Square roots 23.323..., 24.08...) <b>M1</b> for $\tan = \frac{6}{\text{their } \sqrt{20^2 + 12^2}}$ or $\sin = \frac{6}{\text{their } \sqrt{20^2 + 12^2 + 6^2}}$ or $\cos = \frac{\text{their } \sqrt{20^2 + 12^2}}{\text{their } \sqrt{20^2 + 12^2 + 6^2}}$ o.e.

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7 (a)	[0]6 30 o.e., [Feb] 9th	3	<b>B1</b> for [Feb] 9th. <b>B2</b> for [0]6 30 o.e. or <b>M1</b> for $27\frac{1}{2} + 13$ soi or <b>B1</b> for 17 30 or 03 00 seen
(b)	669 (669.0 to 669.1)	1	
(c) (i)	7524 cao final answer	1	
(ii)	0.41	<b>2FT</b>	<b>FT</b> their (d)(i) ÷ 18400 <b>B1FT</b> for 0.409 or 0.4089...i.e not 2 dp
8 (a)	 <p>- 1.49 (- 1.496 to - 1.494) 0.798 (0.7976...)</p>	<b>B2</b>	<b>B1</b> for poor quality sketch Sketch could be with different window. or a different function e.g. $y = \frac{2}{x} - x^3 - 2$
(b)	$x \leq -1.49$ or $-1.496$ to $-1.494$ $x > 0$ $x \leq 0.798$ or $0.7976...$	<b>B1</b> <b>B1</b>	
		<b>1FT</b> <b>1</b> <b>1FT</b>	Condone $<$ for $\leq$ etc <b>FT</b> their (a) if one negative root <b>FT</b> their (a) if one positive root <span style="float: right;"><b>[14]</b></span>
9 (a)	9.18 (9.177...)	3	<b>M2</b> for $2 \times 8 \times \sin 35$ o.e. e.g. $\frac{\sqrt{8^2 + 8^2 - 2.8 \cdot 8 \cos 70}}{AB}$ ( $\sqrt{84.22...}$ ) or <b>M1</b> for $\frac{2}{8} = \sin 35$ o.e. or above expression without square root
(b)	9.77 or 9.78 (9.773 to 9.775...)	2	<b>M1</b> for $\frac{70}{360} \times \pi \times 16$ o.e. Allow $\frac{28\pi}{9}$ o.e. as final answer but must be exact
(c)	9.02 to 9.03 <span style="float: right;">www 4</span>	4	<b>M3</b> for $\frac{70}{360} \times \pi \times 8 - 0.5 \times 8 \times 8 \sin 70$ o.e. or <b>M1</b> for $\frac{70}{360} \times \pi \times 8$ and <b>M1</b> for $0.5 \times 8 \times 8 \sin 70$ o.e. (39.09 to 39.10...) (30.1 or 30.07.....)

<p>10 (a) (i) (ii)</p>  <p>(b) <math>x = 180</math></p> <p>(c) <math>(180, -1)</math></p> <p>(d) <math>\frac{720}{2}</math></p> <p>(e) (i) <math>0 \leq g(x) \leq 2</math></p> <p>(ii) <math>-2 \leq g(x) \leq 2</math></p> <p>(f) 42.9 (42.94...), 317 (317.0 to 317.1)</p> <p>(g) Correct area shaded.</p>		<p>2</p> <p>2</p> <p>1</p> <p>1,1</p> <p>1</p> <p>1</p> <p>1</p> <p>1,1</p> <p>1</p>	<p><b>B1</b> for inaccurate sketch of <math>\cos x</math></p> <p><b>B1</b> for inaccurate sketch of <math>2\sin(\frac{x}{2})</math></p> <p>Condone <math>\pi</math> for 180</p> <p>Condone <math>\pi</math> for 180</p> <p>Condone <math>4\pi</math> for 720</p> <p>Condone strict inequalities, allow <math>x</math> or <math>y</math> for <math>g(x)</math> and allow separate inequalities in parts (i) and (ii)</p> <p>Condone <math>\pi</math> for 180</p> <p>Condone <math>4\pi</math> for 720</p> <p>Condone strict inequalities, allow <math>x</math> or <math>y</math> for <math>g(x)</math> and allow separate inequalities in parts (i) and (ii)</p> <p>Condone <math>\pi</math> for 180</p> <p>Condone <math>4\pi</math> for 720</p> <p>Condone strict inequalities, allow <math>x</math> or <math>y</math> for <math>g(x)</math> and allow separate inequalities in parts (i) and (ii)</p> <p>Condone <math>\pi</math> for 180</p> <p>Condone <math>4\pi</math> for 720</p> <p>Condone strict inequalities, allow <math>x</math> or <math>y</math> for <math>g(x)</math> and allow separate inequalities in parts (i) and (ii)</p> <p>Condone <math>\pi</math> for 180</p> <p>Condone <math>4\pi</math> for 720</p> <p>Condone strict inequalities, allow <math>x</math> or <math>y</math> for <math>g(x)</math> and allow separate inequalities in parts (i) and (ii)</p>
<p>11 (a) (i)</p> <p>(ii)</p> <p>(iii)</p> <p>(b) (i)</p> <p>(ii)</p>	<p><math>\frac{4}{6}</math> o.e.</p> <p><math>\frac{2}{6}</math> o.e.</p> <p>1 o.e.</p> <p><math>\frac{5}{6}, \frac{1}{6}</math> and <math>\frac{5}{6}, \frac{1}{6}</math> and <math>\frac{5}{6}</math></p> <p><math>\frac{1}{36}</math> cao</p>	<p>1</p> <p>1</p> <p>1</p> <p>2</p> <p>2</p>	<p><b>For all parts accept decimals or percentages with the usual rules for 3 sf. Do not penalise incorrect cancelling or converting. Do not accept ratios or words.</b></p> <p><b>SC1</b> for 0.33 if no fraction seen</p> <p><b>B1</b> for any one of the <math>\frac{5}{6}</math> in a correct position</p> <p><b>M1</b> for <i>their</i> <math>\frac{1}{6} \times</math> <i>their</i> <math>\frac{1}{6}</math> (0.0278 or <math>0.02\overline{7}</math> or 0.02777 to 0.02778)</p>

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(iii)	$\frac{11}{36}$ cao	2	<p><b>M1</b> for <math>1 - \text{their } \frac{5}{6} \times \text{their } \frac{5}{6}</math>  (0.306 or <math>0.30\bar{5}</math> or 0.3055 to 0.3056)</p> <p>or <math>\frac{1}{6} + \frac{1}{6} \times \frac{5}{6}</math></p> <p>or (ii) + <math>2 \times \text{their } \frac{1}{6} \times \text{their } \frac{5}{6}</math></p> <p>or <math>\text{their } \frac{1}{6} \times \text{their } \frac{1}{6} + 2 \times \text{their } \frac{1}{6} \times \text{their } \frac{5}{6}</math></p>
(c)	5	2	<p><b>SC1</b> for answer of 4 or <math>6^5 = 7776</math> seen or <math>5^4 = 625</math> seen  or <b>M1</b> for attempted products of <math>\left(\text{their } \frac{5}{6}\right)^k \times \text{their } \frac{1}{6}</math>, <math>k &gt; 1</math></p>
12 (a)	18.75 (18.7 or 18.8) 18.5 23.5 13	1 1 1 1	
(b) (i)	$r = -4.31t + 120$	2	<p><math>-4.313\dots, 120.0\dots</math> <b>B1</b> for <math>r = -4.31t + c</math> or <math>r = kt + 120</math>  Allow <math>x</math> for <math>t</math></p>
(ii)	Negative	1	
(iii)	25 (25.1 to 25.4)	1FT	<b>FT</b> their equation only if linear
13 (a)	$\frac{2}{3} \mathbf{p} + \frac{1}{3} \mathbf{q}$ o.e.	2	<p><b>M1</b> for correct route from <math>O</math> to <math>X</math> or <math>\overline{PQ} = \mathbf{q} - \mathbf{p}</math> o.e. or correct unsimplified answer</p>
(b)	$-\frac{2}{3} \mathbf{p} + \frac{5}{3} \mathbf{q}$ o.e.	3	<p><b>B2</b> for <math>k\mathbf{p} + \frac{5}{3}\mathbf{q}</math> or <math>-\frac{2}{3}\mathbf{p} + k\mathbf{q}</math>, <math>k \neq 0</math> or correct unsimplified expression or  <b>M1</b> for correct route from <math>X</math> to <math>Y</math> or <math>-\frac{2}{3}\mathbf{p} + m\mathbf{q} + n\mathbf{q}</math>, <math>m \neq 0, n \neq 0</math></p>
(c)	$\pm 4$	1,1	<p>If 0 scored, <b>M1</b> for <math>3^2 + k^2 = 5^2</math> o.e.</p>