



Mark Scheme (Results)

Summer 2013

International GCSE Mathematics
(4MB0) Paper 01

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Summer 2013

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded.
- Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme.
- Examiners should also be prepared to award zero marks if the **candidate's response is not worthy of credit according to the mark scheme.**
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark **scheme to a candidate's response, the team leader must be consulted.**
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.
- **Types of mark**
 - M marks: method marks
 - A marks: accuracy marks
 - B marks: unconditional accuracy marks (independent of M marks)
- **Abbreviations**
 - awrt – answers which round to....
 - cao – correct answer only
 - ft – follow through
 - isw – ignore subsequent working
 - SC - special case
 - oe – or equivalent (and appropriate)
 - dep – dependent
 - indep – independent
 - eeoo – each error or omission

- **No working**

If no working is shown then correct answers normally score full marks

If no working is shown then incorrect (even though nearly correct) answers score no marks.

- **With working**

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.

If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks.

Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks.

If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.

If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

If there is no answer on the answer line then check the working for an obvious answer.

- **Ignoring subsequent work**

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: eg. Incorrect cancelling of a fraction that would otherwise be correct.

It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect eg algebra.

Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

- **Parts of questions**

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

International GCSE Maths
Summer 2013 – Paper 01
Mark Scheme

Question Number	Working	Notes		Mark
1	$20 - (9.95 + 0.65 + 0.45 + 5 \times 0.15)$ £ 8.20	M1 A1	2	2

Question Number	Working	Notes		Mark
2	$360 - (216 + 96)$ 48	M1 A1	2	2

Question Number	Working	Notes		Mark
3	$\frac{18}{450} \times 100$ 4	M1 A1	2	2

Question Number	Working	Notes		Mark
4	(3, 4) (<i>accept</i> $x = 3, y = 4$) £ 91.30	M1 A1	2	2
4 Special Case	(-1, -2) or $x = -1, y = -2$ would score B0, B1			

Question Number	Working	Notes		Mark
5(a)	5	B1	1	1
5(b)	4	B1	1	1

Question Number	Working	Notes		Mark
6	a=6, b=0	B1, B1	2	2
6 Special Case	SC(i): a=0, b=6 would score B0, B1 SC(ii): a=0, b=12 would score B0, B1 NB: Must have <u>both</u> values for a one-mark award for a special case			

Question Number	Working	Notes		Mark
7	$x > \frac{-12-13}{3}$ (o.e.) <i>Note: -8.33/-8.34 or better = M1</i> -8 <i>Note: Accept equivalent integer notation</i>	M1 A1	2	2

Question Number	Working	Notes		Mark
8	$2(-3)^3 + (-3)^2 + k(-3) + 6 = 0$ $k = -13$ <i>Note: $k \neq -13$ and missing brackets in first line = M0, A0</i> <i>Note: $k = -13$ and no working shown = M1, A1</i>	M1 A1	2	2

Question Number	Working	Notes		Mark
9	$\begin{pmatrix} 14 \\ 8 \\ 2 \end{pmatrix}$ At least ONE correct value or correct statement seen i.e. 14 or $3 \times 3 + 2 \times 2 + 1 \times 1$ All THREE correct values in a 3 x 1 matrix	M1 A1	2	2

Question Number	Working	Notes		Mark
10	<p>common denominator of either $(x^2 - 1)(x + 1)$ or $(x - 1)(x + 1)$ (o.e.)</p> <p><i>Note: Condone missing final brackets</i></p> <p>numerator of either $x(x + 1) - (x^2 - 1)$ or $x - (x - 1)$ (o.e.)</p> <p><i>Note: A1 available following a single fraction representation with one common denominator</i></p> $\frac{1}{(x - 1)(x + 1)} \text{ (o.e.)}$ <p><i>Note: (o.e.) is $\frac{1}{x^2 - 1}$</i></p> <p><i>Note: Correct answer only seen, award full marks</i></p> <p><i>Note: Do not isw</i></p>	M1 A1 A1	3	3

Question Number	Working	Notes		Mark
11	<p>seeing either $10\sqrt{3}$ or $2 \times 5\sqrt{3}$ or $2\sqrt{3}$</p> $\frac{10\sqrt{3} - 4\sqrt{3}}{2\sqrt{3}}$ <p>3</p> <p><i>Note: Final A mark dependent on at least 1st M mark being awarded</i></p> <p>Alternative Method:</p> $\frac{2\sqrt{75}\sqrt{12} - 4\sqrt{3}\sqrt{12}}{\sqrt{12}\sqrt{12}}$ $\frac{2\sqrt{900} - 4\sqrt{36}}{12}$ <p>3</p>	M1 M1dep A1	3	3
	<p>Alternative Method:</p> $\frac{2\sqrt{75}\sqrt{12} - 4\sqrt{3}\sqrt{12}}{\sqrt{12}\sqrt{12}}$ $\frac{2\sqrt{900} - 4\sqrt{36}}{12}$ <p>3</p>	M1 M1dep A1	3	3

Question Number	Working	Notes		Mark
12(a)	3, 5, 7, 11	B1	1	
12(b)	1, 2, 3, 5, 7, 9, 11 <i>Note: In parts (a) and (b), commas not needed, accept numbers in any order, allow repetitions</i>	B1	1	
12(c)	4	B1	1	3

Question Number	Working	Notes		Mark
13	$\begin{pmatrix} 28 \\ 4 \end{pmatrix}$ and $\begin{pmatrix} 3 \\ -6 \end{pmatrix}$ $\begin{pmatrix} 28 \\ 4 \end{pmatrix} - \begin{pmatrix} 3 \\ -6 \end{pmatrix}$ $\begin{pmatrix} 5 \\ 2 \end{pmatrix}$	B1 M1 A1	3	3
	<p>Alternative Method</p> $5x + 3 = 28$ and $5x - 6 = 4$ Two values: 25 and 10 $\begin{pmatrix} 5 \\ 2 \end{pmatrix}$ <i>Note: Correct answer only seen, award full marks</i>	B1 M1 A1	3	3

Question Number	Working	Notes		Mark
14	$\frac{12}{2 \times 20 \times \pi} = \frac{x}{360} \quad (\text{o.e.})$ <p><i>Note: Any correct equation in x</i></p> $x = \frac{12 \times 360}{2 \times 20 \times \pi}$ <p><i>Note: x as the subject</i></p> <p>34.4° (awrt)</p>	M1		
	<p>Alternative Method (if no variable stated)</p> <p>12/circumference (0.0954...) or circumference/12 (10.47...)</p> <p>0.0954...x360 or 360/10.47</p> <p>34.4° (awrt)</p>	M1		
	<p>Alternative: Use of radians</p> <p>12/20 = 0.6 on its own earns no marks</p> <p>An answer of 0.6 radians earns full marks</p> <p>Arc length = $r\theta$</p> <p>12 = 20x (or 12/20)</p> <p>0.6</p>	M1dep		
		A1	3	3
		A1	3	3
		A1		

Question Number	Working	Notes		Mark
15(a)	$2x - 3 > 0$ followed by a conclusion $x > 1.5$ <p><i>Note: Accept equating $2x - 3$ to zero to find $x = 1.5$ and concluding that the length cannot be zero or less than zero</i></p>	B1	1	
15(b)	$2(2x - 3) + 2(3x + 7)$ (o.e.) $10x + 8$ (o.e.)	M1		
		A1	2	3

Question Number	Working	Notes		Mark
16	$\left(\frac{2}{5}\right)^3$ or $\left(\frac{5}{2}\right)^3$ seen <i>Note: accept ratio or decimal form</i> $\frac{500}{V} = \left(\frac{5}{2}\right)^3$ (o.e.) or $\left(\frac{2}{5}\right)^3 \times 500$ (o.e.) <i>Note: For M1, accept $\frac{2}{7}$ or $\frac{5}{7}$ for $\frac{2}{5}$</i> 32 (awrt)	B1 M1		
		A1	3	3
	Alternative method $\sqrt[3]{500}$ seen $\left(\frac{2}{5} \times \sqrt[3]{500}\right)^3$ 32 (awrt) <i>Note: Accept 7.9 for $\sqrt[3]{500}$</i> <i>Note: For the M1 mark, accept $\frac{2}{7}$ or $\frac{5}{7}$ for $\frac{2}{5}$</i>	B1 M1		
		A1	3	3

Question Number	Working	Notes		Mark
17	4.29×1000 or $\frac{4.29}{97.5}$ or 0.0975 $\frac{4.29 \times 1000}{97.5}$ (o.e.) 44	M1 M1dep		
		A1	3	3
	<i>Note: for first M1, accept 97.5/1000</i>			

Question Number	Working	Notes		Mark
18	$hg + hf = fg$ or $\frac{g+f}{fg} = \frac{1}{h}$ $h(g+f) = fg$ $h = \frac{fg}{g+f}$	M1 M1dep A1	3	3
	<p><i>Note: $\frac{1}{f} + \frac{1}{g} + \frac{1}{h} = 0$ followed by $\frac{gh+fh-fg}{fgh} = 0$ earns NO marks until $hg + hf = fg$</i></p> <p><i>Note: No isw</i></p> <p><i>Note: Answer dependent on first M mark</i></p>			
	<p>Special Case 1</p> $h = \frac{1}{\frac{1}{f} + \frac{1}{g}}$ implies M1, M0, A0 <p>Special Case 2</p> $h = \frac{1}{\frac{g+f}{fg}}$ implies M1, M0, A0			

Question Number	Working	Notes		Mark
19	0.15×10^n or 10^{13} seen any correctly formatted standard form statement 1.5×10^{12} (cao)	B1 M1 A1	3	3
	<p><i>Note: Award 3 marks for correct answer seen (no isw)</i></p>			

Question Number	Working	Notes		Mark
20(a)	Factors 2, 3 and 7 identified <i>Note: Award M1 for at least TWO of the above seen</i> $2^3 \times 3^2 \times 7$ or $2 \times 2 \times 2 \times 3 \times 3 \times 7$	M1 A1	2	
20(b)	14	B1ft	1	3

Question Number	Working	Notes		Mark
21(a)	$\frac{12}{8} = \frac{AE}{6}$ or $\frac{12}{20} = \frac{AE}{AE+6}$ (o.e.) $AE = 9\text{cm}$	M1 A1	2	
21(b)	$\frac{CB}{7} = \frac{20}{12}$ or $\frac{CB}{7} = \frac{"9"+6}{"9"}$ (o.e.) $CB = 11.7\text{cm}$ ($11\frac{2}{3}$) (awrt) <i>Note: accept 11.6 (awrt)</i> <i>Note: Accept (o.e.) for BOTH answers (i.e. 35/3 is acceptable)</i>	M1 A1	2	4

Question Number	Working	Notes		Mark
22(a)	$\frac{x}{60} = \frac{2}{5}$ or $\frac{2}{5} \times 60$ $x = 24$ <i>Note: Do not isw</i>	M1 A1	2	
22(b)	$60 - "24"$ or $\frac{"24"+x}{60+x} = \frac{1}{2} \times "24"$ $"36" - "24"$ or $60 - 2 \times "24"$ or $\frac{1}{2} \times "24"$ <i>Note: For the A mark, the answer must be a positive integer</i>	M1 A1ft	2	4

Question Number	Working	Notes		Mark
23(a)	$x^3 - 3x^2 - 2x + 6$ (allow one slip) If COMPLETELY correct <i>Note: No isw (unless a transcription error)</i>	M1 A1	2	
23(b)	<p>One of candidate's terms correctly differentiated from part (a)</p> <p>A second term correctly differentiated from part (a)</p> <p><i>Note: To gain the method marks, terms may not be suitably/fully simplified (i.e. $3x^{3-1}$ is fine)</i></p> <p><i>Note: If the candidate's answer to part (a) is linear, the 2nd M mark in part (b) is NOT available</i></p> <p><i>Note: No method mark should be awarded for differentiating a constant</i></p> <p>$3x^2 - 6x - 2$ (cao)</p> <p><i>Note: Accept $6x^1$ for $6x$</i></p> <p><i>Note: Any subsequent working loses the last mark (the A mark)</i></p> <p><i>Note: Accept terms in any order</i></p> <p><i>Note: Each term must be suitably simplified</i></p>	M1 M1dep A1	3	5
	<p>Product Rule Method</p> <p>$(x-3)2x + (x^2 - 2)$</p> <p>$2x^2 - 6x + x^2 - 2$</p> <p>$3x^2 - 6x - 2$</p>	M1 M1dep A1	3	

Question Number	Working	Notes		Mark
24	$x^2 - 6x + 4 = 11$ $x^2 - 6x - 7 (= 0)$ <p>attempt to factorise trinomial quadratic</p> <p>Alternatively: Using the formula: correct substitution of candidate's coefficients into a correctly quoted formula</p> <p>Completing the square: from candidate's coefficients, correctly reducing to $(x - a)^2 = b$</p> $x = 7, x = -1$ <p><i>Note: The 2nd M1 mark is independent so it can be earned for attempting to factorise/solve $x^2 - 6x + 4 (= 0)$</i></p> <p><i>Note: 'Correct' answers following an incorrect attempt to solve the correct quadratic (even though the 2nd M mark has been earned), loses the last two A marks</i></p> <p><i>Note: Correct answers followed by further working should have the last A1 deducted (i.e. do NOT isw here)</i></p>	<p>M1</p> <p>A1</p> <p>M1</p> <p>A1, A1</p>	5	5

Question Number	Working	Notes		Mark
25(a)	$(r+4)^2 = r^2 + 72$ or $4(4+2r) = 72$ or $4+2r = 18$ or $r = \sqrt{(4+r)^2 - \sqrt{(72)^2}}$ <i>Note: Accept any equivalent quadratic or linear equation from above statements</i> <i>Note: For 72 accept</i> $(\sqrt{72})^2$ or 8.48^2 or 8.49^2 or 8.485^2	B1	1	
25(b)	$r^2 + 8r + 16 = r^2 + 72$ or $16 + 8r = 72$ or $4 + 2r = 18$ <i>Note: If part (a) is incorrect, award M1 for an attempt at solving their part (a)</i> <i>Note: If a quadratic, see Question 24</i> <i>Note: If linear, correctly solving candidate's equation</i> $r = 7$ (cao) <i>Note: accept correct answer of $r = 7$ with no wrong working seen</i>	M1 A1	 2	
25(c)	$\sin \angle OPC = \frac{"7"}{"7"+4}$ (o.e.) <i>Note: Any correct trig expression from candidate's answer to (b)</i> 39.5° <i>Note: ft from a correct trig equation using candidate's answer to (b)</i> <i>Note: awrt (3SF) a 'correct; angle from candidate's answer to (b)</i>	M1 A1ft	 2	 5

Question Number	Working	Notes		Mark																		
26	$\frac{58}{87} \text{ or } \frac{87}{58} \text{ or } \frac{\text{Total}}{58} = \frac{360}{87} \text{ or Total} = 240$ <p><i>Note: At least one correct table entry implies method</i></p> <table border="1" data-bbox="387 510 1026 763"> <thead> <tr> <th><u>Lake</u></th> <th><u>Area in km²</u></th> <th><u>Angle at centre</u></th> </tr> </thead> <tbody> <tr> <td>Superior</td> <td></td> <td>123</td> </tr> <tr> <td>Huron</td> <td></td> <td>88.5</td> </tr> <tr> <td>Michigan</td> <td></td> <td></td> </tr> <tr> <td>Erie</td> <td>24</td> <td></td> </tr> <tr> <td>Ontario</td> <td>17</td> <td>25.5</td> </tr> </tbody> </table> <p>123</p> <p>88.5</p> <p>24</p> <p>"25.5"</p> <p>"17"</p> <p><i>Note: "25.5" is a ft total for last column (independent of the M mark)</i></p> <p><i>Note: Accept the following rounded answers: 89 and 26</i></p>	<u>Lake</u>	<u>Area in km²</u>	<u>Angle at centre</u>	Superior		123	Huron		88.5	Michigan			Erie	24		Ontario	17	25.5	M1		
<u>Lake</u>	<u>Area in km²</u>	<u>Angle at centre</u>																				
Superior		123																				
Huron		88.5																				
Michigan																						
Erie	24																					
Ontario	17	25.5																				
	<p><i>Note: Final B1ft mark is for either $\frac{2}{3} \times 25.5$ (17) or $240 - (\text{Sum of other areas})$</i></p> <p><i>or</i></p> <p>$\frac{2}{3} \times "25.5" \text{ or } \frac{3}{2} \times "25.5"$</p> <p><i>Note: For the B marks, accept answers that round to 3 figures "correctly"</i></p> <p><i>Note: Accept rounded answers to integer forms for the two B1ft marks</i></p> <p><i>Note: 38 or 38.25 is not an acceptable answer for the final B mark</i></p>	A1 A1 A1 B1ft B1ft	6	6																		

Question Number	Working	Notes		Mark
27(a)	$\angle BPC = 90^\circ$ (\angle in a semicircle) <i>Note: for reason "angle made by diameter" or "chords from diameter to circumference"</i> <i>Note: Do not accept tangent – radius</i> $\angle PBC = 58^\circ$ (alt segment) <i>Note: Angles can be marked on the diagram</i> $\angle PCB = 32^\circ$	M1		
		M1		
		A1	3	3
	Alternative Working 1: $(\angle APB = 32^\circ)$ $\angle PCB = 32^\circ$ (alt segment) = M1 <i>Note: for reason accept "angle between a tangent and a chord" or "tangent-secant"</i> <i>Note: Do not accept "tangent-radius"</i> $\angle PCB = 32^\circ$ = A1			
Alternative Working 2: $\angle BPC = 90^\circ$ (\angle in a semicircle) = M1 $(\angle APB = 32^\circ)$ $\angle PCB = 32^\circ$ (alt segment) = M1, A1				
Special Case: Correct answer with (or without reasons) scores at least the final A mark Note to ALL above alternatives: Accept $\angle PCB = 32^\circ$ marked on the diagram for final A mark.				
27(b)	$\angle PAB = 180 - 90 - "32" - "32"$ (o.e.), $(\angle$ sum of Δ) $= 26^\circ$ (accept correct angle marked on diagram) <i>Note: A correct numerical attempt to find the required angle from candidate's figures for first M mark</i>	M1, M1dep A1	3	3

	<p><i>Note: No working shown and angle not 26° means 1st M mark not earned.</i></p> <p><i>Note: For reason, accept an equivalent statement involving a triangle e.g. "exterior angle of a triangle" for the M1dep mark</i></p>			
	<p>Special Case: Correct answer with (or without) reasons scores at least the final A mark</p>			

Question Number	Working	Notes		Mark
28(a)	<p>A correct attempt to diff. At least one term</p> <p>$2kt - 6$</p> <p>"$2k(1) - 6 = 0$"</p> <p>$k = 3$</p> <p><i>Note: $s(1) = 0$ leading to $k = 3$ earns no marks</i></p> <p><i>Note: $k = 3$ earns full marks provided that the first M mark is earned and no wrong working is seen</i></p>	<p>M1</p> <p>A1</p> <p>M1dep</p> <p>A1</p>	4	4
28(b)	<p>Either $s(3) = "3"(3^2) - 6 \times 3 + 3$ (12)</p> <p>or $s(2) = "3"(2^2) - 6 \times 2 + 3$ (3)</p> <p>$s(3) - s(2)$ or $s(2) - s(3)$</p> <p>9m</p> <p><i>Note: accept -9 for the A1 mark</i></p>	<p>M1</p> <p>M1</p> <p>A1</p>	3	7

Question Number	Working	Notes		Mark
29(a)	$AE = \sqrt{30^2 - 18^2}$ + conclusion <i>Note: Sufficient to state a correct Pythagorean statement with 30 and 18 substituted + conclusion</i>	B1	1	
29(b)	$\sin \angle DAE = \frac{18}{30}$ (o.e.) <i>Note: A correct trig statement to find either $\angle DAE(36.9^\circ)$ or $\angle ADE(53.1^\circ)$</i> 36.9° or 53.1° <i>Note: Accept awrt either 37° or 53°</i> 53.1° (cao) <i>Note: Accept angles, marked correctly, on the diagram</i> <i>Note: Answer only seen implies full marks</i> <i>Note: The answer must be as seen for the final A mark.</i>	M1 A1 A1	3	
29(c)	$\frac{h}{25} = \cos 53.1^\circ$ or $\frac{18}{x} = \frac{30}{25}$ = 15 $24 + "15"$ (39) (awrt their 3SF answer) <i>Note: Final A1ft mark dependent on method</i> <i>Note: If the final answer is a whole number, accept 2SF</i> <i>Note: Beware of</i> $DB = \sqrt{(30)^2 + (25)^2} = 39.0512\dots$ this is not incorrect but requires to be multiplied by $\sin(180 - 92.03\dots)$ to gain M1, A1 then final answer is A1ft	M1 A1 A1ft	3	7

	<i>Note: Penalise use of radians once only in any dependent A mark</i>			
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