



Mark Scheme (Results)

Summer 2013

International GCSE Mathematics (4MB0) Paper 02

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications come from Pearson, the world's leading learning company. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information, please visit our website at www.edexcel.com.

Our website subject pages hold useful resources, support material and live feeds from our subject advisors giving you access to a portal of information. If you have any subject specific questions about this specification that require the help of a subject specialist, you may find our Ask The Expert email service helpful.

www.edexcel.com/contactus

Pearson: helping people progress, everywhere

Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at:

www.pearson.com/uk

Summer 2013

Publications Code UG037230

All the material in this publication is copyright

© Pearson Education Ltd 2013

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 02
Mark Scheme

Question Number	Working	Notes		Mark
1	$15 \times EC = 18 \times 24$ (o.e.) $EC = 28.8 \text{ cm}, \frac{432}{15} \text{ cm}$ $15 + "28.8" (43.8)$	M1 A1 A1ft	3	3

Question Number	Working	Notes		Mark
2(a)	$\frac{1 \times 4 + 2 \times 10 + 3 \times 15 + 4 \times x + 5 \times 17}{4 + 10 + 15 + x + 17} = 3.5$ (o.e.)	B1	1	
2(b)	"correctly removing denominator and gathering constants in their eqn" $4x - 3.5x = 161 - 154$ (o.e) $x = 14$	M1 A1	2	
2(c)	5	B1ft	1	4
NB (1)Dep on using cand.'s x in (b) (2)If using negative value for x, then BO				

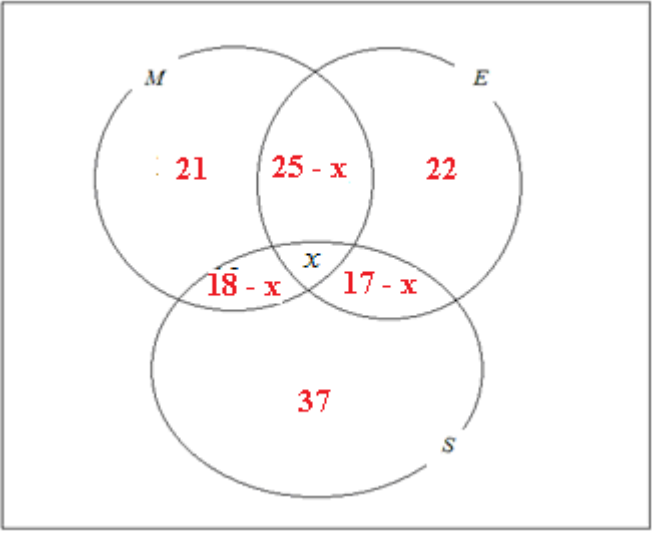
Question Number	Working	Notes		Mark
3(a)	$\sqrt{(17^2 - 15^2)}$ 8 cm	M1 A1	2	
3(b)	$\pi "8"{}^2 + \pi "8" \times 17$ (both areas involving π added) Correct conclusion	M1 A1	2	4

Question Number	Working	Notes		Mark
4(a)	$9a + b = 21$ $25a + b = 69$ NB: Note the order of the above award of Bs for ePEN	B1 B1	2	
4(b)	correct attempt to solve their sim. equations (no slips) Eg: see $16a = 48$ (M1) then $a = 3$ (A1) then $b = -6$ (A1) OR see $16b = -96$ (M1) then $b = -6$ (A1) then $a = 3$ (A1) $a = 3$ $b = -6$ NB: Note the order of the above award of As for ePEN	M1 A1 A1	3	
4(c)	$"3"(-1)^2 + "-6"$ -3	M1 A1 ft	2	7

Question Number	Working	Notes		Mark
penalise incorrect/missing labels once only in the question eg for ΔABC, the vertices A, B and C must be labelled.				
5(a)	ΔABC	B1	1	
5(b)	$\begin{pmatrix} 1 & -1 & -1 \\ 5 & 3 & 5 \end{pmatrix}$	B2(-1eeoo)	2	
5(c)	$\Delta A'B'C'$	A1ft	1	
5(d)	$\begin{pmatrix} 1 & -1 \\ 3 & -1 \end{pmatrix}$ „ $\begin{pmatrix} 1 & -1 & -1 \\ 5 & 3 & 5 \end{pmatrix}$ “ $\begin{pmatrix} -4 & -4 & -6 \\ -2 & -6 & -8 \end{pmatrix}$ OR $(-4, -2), (-4, -6), (-6, -8)$ (cao) $\Delta A''B''C''$	M1 A1 A1ft	 3	
5(e)	enlargement -2 centre (0,0) <i>Note: Please note the order of B marks above when entering marks onto ePen</i> <i>Note: The candidate's answer must be a SINGLE transformation, otherwise award ZERO marks</i>	B1 B1 B1	 3	10

Question Number	Working	Notes		Mark
6(a)	800×49.22 39376	M1 A1	2	
6(b)	$\frac{39376}{60.05}$ awrt £656 or better e.g. £655.72 $\pounds 800 - \pounds 655.72 = \pounds 144$	M1 A1 A1ft	3	5

Question Number	Working	Notes		Mark
7(a)	$\overrightarrow{AB} = 18\mathbf{b} - 3\mathbf{a}$	B1	1	
7(b)	$2\mathbf{a}$ and $6\mathbf{b}$	B1		
	$\overrightarrow{CD} = 6\mathbf{b} - 2\mathbf{a}$	B1	2	
7(c)	$\overrightarrow{OX} = \overrightarrow{OC} + \overrightarrow{CX} = "2\mathbf{a}" + \frac{1}{2}("6\mathbf{b} - 2\mathbf{a}")$ OR $\overrightarrow{OX} = \overrightarrow{OD} + \overrightarrow{DX} = "6\mathbf{b}" - \frac{1}{2}("6\mathbf{b} - 2\mathbf{a}")$ $\overrightarrow{OX} = 3\mathbf{b} + \mathbf{a}$ (cao)	M1 A1	 2	
7(d)	$\overrightarrow{OY} = \mu("3\mathbf{b} + \mathbf{a}')$	B1ft	1	
7(e)	$\overrightarrow{OY} = "2\mathbf{a}" + \lambda.18\mathbf{b}$	B1ft	1	
7(f)	$\mu = 2$ and $3\mu = 18\lambda$ (equating "coefs" of $\mathbf{a}$ and $\mathbf{b}$) $\mu = 2$ (cao) $\lambda = 1/3$ (cao) <i>Note: Please note the order of the A marks in part (f) when entering your marks on ePen</i> <i>Note: The A marks are dependent on the M mark having been awarded and also from correct equations for μ and λ</i>	M1 A1 A1	 3	
7(g)	$1 : 3$ (o.e.)	B1	1	11

Question Number	Working	Notes		Mark
8(a)	$25 - x$	B1	1	
8(b)	 any TWO of $18 - x$, $17 - x$, "$25 - x$" all THREE of $18 - x$, $17 - x$, "$25 - x$" 21, 22, 37	B1ft B1ft B1ft	3	
NB: In parts (c) and (d) below, treat missing or deleted "$25 - x$" in the diagram as zero.				
8(c)	a correct and complete expression from their diagram = 120 (i.e. "$21 + (25 - x) + 22 + (18 - x) + x + (17 - x) + 37$" = 120 $x = 10$	M1 A1	2	
8(d)	(i) $120 - "22"$ (ft from their (b) and (c)) (ii) $"(25 - "10")"$ (ft from their (a) and (c)) OR $21 + (25 - "10") + (18 - "10") + "10" + (17 - "10") + 37$	B1ft B1ft	2	
8(e)	17 (numerator) ie $n(S \cap E) = x + "17 - x"$ or identified 62 (denominator) ie $n S = "18 - x" + "17 - x" + x + 37$ or identified $\frac{17}{64}$, 0.274 (cao)	B1ft B1ft B1		

	<i>Note: If no fraction given then B0, B0, B0</i> <i>Note: If no working seen, but a correct answer is seen (fraction or decimal) then award B1, B1, B1</i> <i>Note: If an incorrect decimal answer, then check for 17 as numerator and/or 62 as denominator to award the initial B marks</i>			
--	--	--	--	--

Question Number	Working	Notes		Mark
Only penalise final answer not corrected to the required degree of accuracy the first time it occurs in the question				
9(a)	30° and 40° correctly identified conclusion	M1 A1		2
9(b)	(i) $\frac{200}{\sin 70^\circ} = \frac{150}{\sin C}$ $\angle C = \sin^{-1}\left(\frac{150 \times \sin 70^\circ}{200}\right)$ 44.8° (ii) 40 + "44.8" 84.8 Alternative for (ii) 180 – 30 – "65.2" (65.2=180-70-"44.8") = 84.8 Alternative for (ii) $\angle BCN = 360 - ("44.8" + 220) = 95.2$ $\therefore \angle NBC = 180 - "95.2"$ (iii) ($\angle ABC = 65.2$ (= 180-70-"44.8") or eg seen on diagram) $AC^2 = 150^2 + 200^2 - 2 \times 150 \times 200 \times \cos "65.2"$ $AC = \sqrt{62500 - 60000 \times \cos "65.2"} = \sqrt{37332.9}$ 193m (cao) Alternative for (iii) $\frac{AC}{\sin 65.2} = \frac{200}{\sin 70} = \frac{150}{\sin 44.8} = M1$ $AC = \frac{200 \times \sin 65.2}{\sin 70} \text{ OR } \frac{150 \times \sin 65.2}{\sin 44.8} = M1\text{dep}$	M1 M1dep A1 M1 A1ft M1 M1dep A1		8
9(c)	total distance travelled = 4x(150+200+"193") (=2172)	M1 M1dep		3

	$\text{time} = \frac{4 \times (150 + 200 + "193")}{1.5} \quad (1448 \text{ secs})$	A1		
	1448 secs, 1449 secs			
9(d)	journey time = "1448"-180 (=1268 secs) $\text{average speed} = \frac{4 \times (150 + 200 + "193")}{"1268"}$ = awrt 1.7 m/s (i.e. from 1.71, 1.72) <i>Note: for parts (c) and (d), if the factor 4 is missing in both (c) and (d) then the maximum score would be:</i> (c) M0, M0, A0 (d) M1, M1, A0 <i>Note: The A mark in part (d) is dependent on the A mark in (c) having been obtained</i>	B1ft M1 A1	3	

Question Number	Working	Notes		Mark
10(a)	$2x^2y = 16$ $y = \frac{8}{x^2}$	M1 A1	2	
10(b)	$2 \times 2x \times \frac{8}{x^2} + 2 \times x \times \frac{8}{x^2} + 2x \times x$ correct conclusion	M1 A1	2	
10(c)	32, 34, 59.6 <i>Note: Please note the order of the Bs when entering marks on ePen</i>	B1 B1 B1	3	
10(d)	graph penalties (-1) • straight line segments • each point missed ($\pm \frac{1}{2}$ small square ie ± 0.05) • each missed segment • each point not plotted • each point incorrectly plotted ($\pm \frac{1}{2}$ small square ie ± 0.05) • tramlines • very poor curve (e.g. line too thick) <i>Note: Deduct marks for errors as they appear starting at $x=1$ through to $x=5$. Ignore any curve drawn from $x=0$ to $x=1$ (i.e. start checking from 1,50)</i>	B3	3	
In parts (e) and (f), penalise 1dp ONCE ONLY				
10(e)	1.3 ($\pm \frac{1}{2}$ small square ft) 3.7	B1ft B1ft	2	
10(f)	indication on graph of attempt at minimum 2.3 $y = \frac{8}{2.3^2}$ 1.5 <i>Note: for M1dep, dependent on candidate using their graph (ie reading off x for S_{min} and not using calculus)</i>	M1 A1ft M1"dep" A1ft	4	16

Question Number	Working	Notes		Mark
11(a)	3, 6, 9, 12	B1	1	
11(b)	$4/12, 1/3, 0.333$	B1	1	
11(c)	(1/3, 2/3) or (4/12, 8/12) twice on each pair of <i>given</i> branches correct branching added (penalise labelling) correct probabilities added	B1, B1 B1 B1	4	
Special case for parts (a), (b) and (c): If only three multiples are given in the answer to part (a), this would score B0. All FOUR must be present to obtain the mark. However, a ft mark would be awarded in part (b) if 3/12, 1/4 or 0.25 is seen. A ft would also be allowed in part (c) on the first two B1 marks and on the final B1 mark if 3/12, 1/4 or 0.25 is seen.				
11(d)	$\frac{2}{3} \times \frac{1}{3}$ or $\frac{8}{12} \times \frac{4}{12}$ (o.e.) ft errors from <i>their</i> diagram probabilities $\frac{32}{144}, \frac{2}{9}, 0.222$	M1 A1ft	2	
11(e)	$P(A \text{ wins}) = \frac{1}{3} + \frac{2}{3} \times \frac{2}{3} \times \frac{1}{3}$ ft errors from <i>their</i> diagram probabilities $= \frac{13}{27}, 0.481$	M1 A1 M1		

	$P(\text{B wins}) = \frac{2}{3} \times \frac{1}{3} + \frac{2}{3} \times \frac{2}{3} \times \frac{2}{3} \times \frac{1}{3} = \frac{13}{27}$ ft errors from <i>their</i> diagram probabilities $= \frac{26}{81}, 0.321$ comparing two fractions or their decimal values and correct conclusion	A1 A1		5	13
--	--	--------------	--	---	----

Further copies of this publication are available from
Edexcel Publications, Adamsway, Mansfield, Notts, NG18 4FN

Telephone 01623 467467
Fax 01623 450481
Email publication.orders@edexcel.com

Order Code UG037230 Summer 2013

For more information on Edexcel qualifications, please visit our website
www.edexcel.com

Pearson Education Limited. Registered company number 872828
with its registered office at Edinburgh Gate, Harlow, Essex CM20 2JE



Llywodraeth Cynulliad Cymru
Welsh Assembly Government

