

Mark Scheme (Results)

January 2014

Pearson Edexcel International GCSE
Mathematics B (4MB0/02) Paper 2

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

January 2014

Publications Code UG037800

All the material in this publication is copyright

© Pearson Education Ltd 2014

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.
- 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**
 - 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.

- **Follow through marks**

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.

Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

- **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.

- **Probability**

Probability answers must be given as fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).

Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.

If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.

If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

- **Linear equations**

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

- **Parts of questions**

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

Question Number	Answer	Notes	Mark
1(a)	$2 - 5 \leq 3x - x$ (o.e)	M1	
	$x \geq -\frac{3}{2}, -1.5$	A1	
	$3x - 2x \leq 7 - 5$ (o.e)	M1	
	$x \leq 2$	A1	4
	(OR $-\frac{3}{2} \leq x \leq 2$ scores A2)		
(b)	-1, 0, 1, 2	B1 ft	1
		Total 5 marks	

Question Number	Answer	Notes	Mark
2	$\frac{65}{100} \times 80 \times 100$ (=£5200) + $\frac{55}{100} \times 80 \times 50$ (=£2200)	M1	
	$\frac{45}{100} \times 80 \times (280 - "150")$ (=£4680)	M1 (DEP)	
	"£5200" + "£2200" + "£4680"	M1 (DEP)	
	£12 080.00	A1	4
		Total 4 marks	

Question Number	Answer	Notes	Mark
3(a)	time(hours) = $\frac{45}{50}$ h	M1	
	time (mins) = $\left(\frac{45}{50}\right) \times 60$	M1 (DEP)	
	54 mins	A1	3
(b)	$\frac{"54"}{60} \times \frac{180}{100}$ (= 1.62 h)	M1	
	"1.62" $\times 70$	M1 (DEP)	
	113.4 km	A1	3
		Total 6 marks	

Question Number	Answer	Notes	Mark
4(a)	$\begin{pmatrix} -2 & 1 \\ -5 & 2 \end{pmatrix}$	B2 (- 1eeoo)	2
	NB: Treat incorrect value for determinant (if seen) as 1 error st cand. can still obtain 1 B1 mark for the rearranged matrix.		
(b)	$\begin{pmatrix} -2 & 1 \\ -5 & 2 \end{pmatrix} \begin{pmatrix} 2 & -1 \\ 5 & -2 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} -2 & 1 \\ -5 & 2 \end{pmatrix} \begin{pmatrix} -1 \\ 1 \end{pmatrix}$		
	(o.e , complete method)	M1	
	$x = 3$ and $y = 7$ (identified and cao)	A1, A1	3
		Total 5 marks	

Question Number	Answer	Notes	Mark
5(a)(i)	y	B1	
(ii)	z	B1	
(iii)	x	B1	3
(b)	$y(x+2) = 1$	M1	
	$h^{-1} : x \mapsto \frac{1-2x}{x}$	A1	
(c)	" $x^2 - 2x + 1 = 0$ (remove denominator, no slips)	M1	2
	$(x-1)(x-1) = 0$ (Factorising a trinomial quadratic)	M1 (DEP)	
	$x = 1$	A1	3
		Total 8 marks	

Question Number	Answer	Notes	Mark
6(a)	<p> $\frac{2}{7}$ Rains $\frac{5}{7}$ Does not rain $\frac{4}{5}$ Bus not late $\frac{1}{5}$ Bus late $\frac{5}{6}$ Bus not late $\frac{1}{6}$ Bus late </p>	B3 (-1eeoo)	3
(b)	$\frac{2}{7} \times \frac{1}{5}$		
	$\frac{2}{35}$, 0.0571		2
(c)	$\frac{2}{7} \times \frac{1}{5} + \frac{5}{7} \times \frac{1}{6}$		
	one correct product	M1	
	both correct and added	M1 (DEP)	
	$\frac{37}{210}$, 0.176	A1	3
		Total 8 marks	

Question Number	Answer	Notes	Mark
7(a)	$125 \times (2 \times 24 \times 60)$	M1	
	360 000 litres	A1	2
(b)	Vol of pool = $25 \times 15 \times 1.2 m^3$	M1	
	= $25 \times 15 \times 1.2 \times 1000 l$ (= $450 \times 10^3 l$)	M1 (DEP)	
	Time (mins) = $\frac{450 \times 10^3}{125}$	M1 (DEP)	
	Time (hours) = $\frac{450 \times 10^3}{125} \times \frac{1}{60}$	M1 (DEP)	
	Time = 60 hours	A1	5
(c)	New rate = $125 \times \frac{60}{10}$ (o.e)	M1	
	New Rate = 750 litres/ min	A1	2
		Total 9 marks	

Question Number	Answer	Notes	Mark
8(a)	Penalise ncc ONCE only		
	$\frac{EB}{\sin 45} = \frac{10}{\sin 50}$	M1	
	$EB = \frac{10 \times \sin 45}{\sin 50}$	M1 (DEP)	
	$EB = 9.231 \rightarrow \mathbf{9.23}$	A1	3
(b)	$\frac{AB}{\sin 85} = \frac{10}{\sin 50}$	M1	
	$AB = 13.004 \rightarrow \mathbf{13.0}$ (cc)	A1	2
(c)	$BC = \sqrt{14^2 - 13.0^2}$	M1	
	$BC = 5.196 \rightarrow 5.20$ (using 13.0)		
	$BC = 5.186 \rightarrow 5.19$ (using 13.004)		
	5.19, 5.20	A1	2
(d)	$"5.196^2 = "9.231^2 + "9.231^2 - 2 \times "9.231 \times "9.231 \times \cos \angle BEC$		
		M1	
	$\cos \angle BEC = \frac{"9.231^2 + "9.231^2 - "5.196^2}{2 \times "9.231 \times "9.231}$	M1 (DEP)	
	$\angle BEC = 32.693 \rightarrow \mathbf{32.6, 32.7^0}$	A1	3
	(Using "9.23" and "5.20" leads to 32.72, Using "9.231" and "5.186" leads to 32.63)		
	OR		
	($\triangle BEC$ is isos. \triangle and pt. X is mid-pt. of BC)		
	$\angle BEC = 2 \times \angle BEX$	M1	
	$\sin \angle BEX = \frac{\left(\frac{1}{2} \times "5.196\right)}{"9.231}$	M1 (DEP)	
	$\angle BEC = \mathbf{32.6, 32.7^0}$	A1	
(e)	$\triangle AEB + \triangle EDC = 2 \times \left(\frac{1}{2} \times 13 \times 10 \times \sin 45\right) (= 91.92)$	M1	
	$\triangle EBC = \frac{1}{2} \times "9.231 \times "9.231 \times \sin "32.69" (= 23.01)$	M1	
	$\triangle EDA = \frac{1}{2} \times "5.196 \times \sqrt{\left(10^2 - \left(\frac{1}{2} \times "5.196\right)^2\right)} (= 25.09)$		
		M1	
	(Using "5.2" produces 25.11)		
	4 triangular face areas added	M1 (DEP)	
	140 cm^2 (using 3 or 4 sf)	A1	5
		Total 15 marks	

Question Number	Answer	Notes	Mark
9(a)(i)	$\overrightarrow{AB} = \mathbf{b} - \mathbf{a}$	B1	
(ii)	$\overrightarrow{AP} = \frac{3}{4} (\mathbf{b} - \mathbf{a})$	B1 ft	
(iii)	$\overrightarrow{OP} = \mathbf{a} + \frac{3}{4} (\mathbf{b} - \mathbf{a})$ (o.e)	M1	
	$= \frac{1}{4} \mathbf{a} + \frac{3}{4} \mathbf{b}$	A1	4
(b)(i)	$\overrightarrow{OC} = \mathbf{a} + \mu \mathbf{b}$	B1	
(ii)	$\overrightarrow{PC} = -\frac{3}{4} (\mathbf{b} - \mathbf{a}) + \mu \mathbf{b}$	M1	
	$= \frac{3}{4} \mathbf{a} + (\mu - \frac{3}{4}) \mathbf{b}$ OR $\frac{3}{4} \mathbf{a} + \mu \mathbf{b} - \frac{3}{4} \mathbf{b}$	A1	3
(c)(i)	$\frac{1}{4} \mathbf{a} + \frac{3}{4} \mathbf{b} = \lambda (\mathbf{a} + \mu \mathbf{b})$	M1	
	equate coeffs. of \mathbf{a} : $\frac{1}{4} = \lambda$	M1 (DEP), A1	
(ii)	equate coeffs. of \mathbf{b} : $\frac{3}{4} = \lambda \mu$	M1	
	$\frac{3}{4} = \frac{1}{4} \mu$ (subst.)	M1 (DEP)	
	$\mu = 3$	A1	6
(d)	$OP : PC = 1 : 3$	B1	
		Total 14 marks	

Question Number	Answer	Notes	Mark
10(a)	$S_{Roof} = 2A + \pi x \frac{y}{2}$ (one of) $S_{Box} = 2x^2 + 2xy$	M1	
	$S = 2x^2 + xy(2 + \frac{\pi}{2}) + 2A$ (adding)	M1 (DEP)	
	cc	A1	3
(b)	$10x = x^2y$	M1	
	$\therefore y = \frac{10}{x}$ (cc)	A1	2
(c)	$2A \left(= \pi \left(\frac{y}{2} \right)^2 \right) = \frac{25\pi}{x^2}$	M1	
	$S = 2x^2 + x \left(\frac{10}{x} \right) \left(2 + \frac{\pi}{2} \right) + \frac{25\pi}{x^2}$ (subst.)	M1 (DEP)	
	$S = 2x^2 + 10 \left(2 + \frac{\pi}{2} \right) + \frac{25\pi}{x^2}$ (cc)	A1	3
(d)	63.3, 66.6, 80.1	B3 (- 1eeoo)	3
	NB: Penalise ncc ONCE only		
(e)	curve		
	-1 mark straight line segments each point missed each missed segment each point not plotted each point incorrectly plotted tramlines very poor curve	B3 (- 1eeoo)	3
(f)	1.4 and 4.5	B1 ft	
	$1.4 \leq x \leq 4.5$	B1 ft	2
		Total 16 marks	

Question Number	Answer	Notes	Mark
11	Penalise labelling ONCE only		
(a)	Triangle A drawn and labelled	B1	1
(b)(i)	Triangle B is (2, 0), (4, 6) and (6, 4) or $\begin{pmatrix} 2 & 4 & 6 \\ 0 & 6 & 4 \end{pmatrix}$	B1	
(ii)	Triangle B drawn and labelled	B1	2
(c)(i)	Triangle C is (0, 2), (-3, 4) and (-2, 6) or $\begin{pmatrix} 0 & -3 & -2 \\ 2 & 4 & 6 \end{pmatrix}$	B2 ft (-1eeoo)	
(ii)	Triangle C drawn and labelled	B1 ft	3
(d)(i)	Triangle D is (1, 0), (2, -3) and (3, -2) or $\begin{pmatrix} 1 & 2 & 3 \\ 0 & -3 & -2 \end{pmatrix}$	B2 ft(-1eeoo)	
(ii)	Triangle D drawn and labelled	B1 ft	3
(e)	Reflection in x -axis	B1	1
		Total 10 marks	

Total 100 marks

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