



# Mark Scheme (Results)

June 2016

Pearson Edexcel International GCSE  
Mathematics B (4MB0)  
Paper 01

## **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](http://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](http://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](http://www.pearson.com/uk)

Summer 2016

Publications Code 4MB0\_01\_1606\_MS

All the material in this publication is copyright

© Pearson Education Ltd 2016

## 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**
  - 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				
Q	Working	Answer	Mark	Notes
1	$\frac{-4 - (-1)}{-3 - 6}$ OR $\frac{-1 - (-4)}{6 - (-3)}$ (o.e.)		2	M1
		$\frac{1}{3}$ (oe), 0.33		A1
				Total 2 marks

2	$2(9x^2 - y^2)$ OR $(6x - 2y)(3x + y)$ OR $(3x - y)(6x + 2y)$		2	M1
		$2(3x - y)(3x + y)$		A1 Allow ISW
				Total 2 marks

3	$\frac{2.09 - 1.91}{1.91} \times 100 \left( = \frac{0.18}{1.91} \times 100 \right)$		2	M1
		9.42% (awrt)		A1
				Total 2 marks

4	$9b^3$ OR $a^{-1}$ (o.e.) OR $\frac{36b^3}{4a}$		2	M1
	$9b^3a^{-1}$ or $\frac{9b^3}{a}$			A1 ISW
				<b>Total 2 marks</b>

5	Diagram showing correct bearing angle at Nashik <b>OR</b> $142 + 180$ OR $360 - 38$		2	M1
		$322^\circ$		A1
				<b>Total 2 marks</b>

6	$3 - 2(3 - 2x)$			M1
		$-3 + 4x$ (oe)		A1
				<b>Total 2 marks</b>

7		$A \cup B = \{a, b, c, d, e, g, i\}$	2	B1
		$(A \cup B)' = \{f, h, j\}$  <b>OR</b> (1) B2(-1eeoo) if $A \cup B = \{a, b, c, d, e, g, i\}$ not seen  OR (2) Venn Diagram showing correct elements in $A$ and $B$ scores B1 then Venn Diagram showing correct elements in $(A \cup B)'$ scores B1 (unless 'condemned' on the answer line then NO isw...)		B1 ft Condone missing brackets
				<b>Total 2 marks</b>

8	$\frac{1}{2}(23+59)h = 574$  OR $h = \frac{574}{\frac{1}{2}(23+59)} \left( = \frac{1148}{82} = \frac{574}{41} \right)$		2	M1
		$h = 14$		A1
				<b>Total 2 marks</b>

<b>9</b>	$\frac{3.2x - 5.x}{x.2x}$ (oe)			M1
		$\frac{1}{2x}$ (oe)		A1
				<b>Total 2 marks</b>

<b>10</b>	$2(3x - 1) - 6x + 7$ OR $2p^2 - 2(p^2 + 1) + 7$		2	M1
		5		A1
				<b>Total 2 marks</b>

<b>11</b>	a	318	1	B1 ft on “(a)” and their “3.18” does not have to be rounded but is “correct”
	b	“3.18” $\times 10^n$	2	B1 ft ( <i>attempt</i> at SF (overlook incorrect truncation of “3.18”))
		“3.18” $\times 10^2$		B1 ft
				<b>Total 3 marks</b>



12	$6x - 8 - 4 + 12x = 3x + 12$			M1 allow one sign slip
	$6x + 12x - 3x = 12 + 8 + 4$			M1 gathering "terms"
		$1.6, \frac{24}{15}, \frac{8}{5}$		(DEP) A1
				Total 3 marks

13	$x : y = 30 : 48$ and $y : z = 48 : 56$  OR $\begin{matrix} x : & y : & z \\ 30 & 48 & \\ & 48 & 56 \end{matrix}$ (oe)  OR $\frac{x}{y} = \frac{5}{8}$ and $\frac{y}{z} = \frac{6}{7}$		3	M1
	$x : z = 30 : 56$  OR $\frac{x}{y}, \frac{y}{z} = \frac{x}{z} = \frac{30}{56}$			M1 (DEP)
		$x : z = 15 : 28$		A1
				Total 3 marks

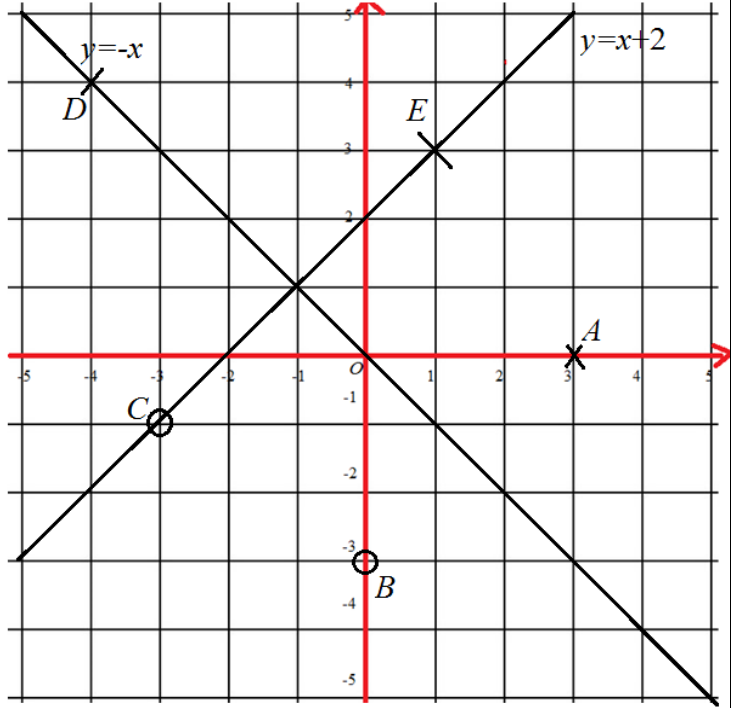
14	$\frac{3x}{2} + (2x+5) = (4x-15)$		3	M1 (geometrical statement)
	Either $5+15 = 4x-2x-\frac{3x}{2}$ OR $10+30 = 8x-4x-3x$			M1 (DEP)
	OR $\frac{3x}{2} + (2x+5) + \{180-(4x-15)\} = 180$			M1
	$\frac{3x}{2} + 2x - 4x = 180 - 5 - 180 - 15$			M1 (DEP)
	OR $4x-15+y=180$ and $2x+5+\frac{3x}{2}+y=180$			M1
	Correctly eliminating			M1 (DEP)
		x=40		A1
				<b>Total 3 marks</b>

15		$n = 2m$ OR $m = 1 - 2m$ seen	3	B1
		$m = \frac{1}{3}, 0.333$		B1
		$n = \frac{2}{3}, 0.667$		B1
				<b>Total 3 marks</b>

16	$2x+1 > 6x-10$ OR $x + \frac{1}{2} > 3x-5$		3	M1
	$11 > 4x$ OR $-11 < -4x$ OR $5\frac{1}{2} > 2x$ OR $-5.5 < -2x$			M1 (DEP)
		x=2		A1 Use of equality instead of inequality scores M1 M1 A0
	<b>Trial and Error Method:</b> Must examine inequality at one of $x = 2$ and $x = 3$ Examined at <b>both</b> $x = 2$ and $x = 3$  $x = 2$			M1 x = 2 seen and no incorrect working seen implies full marks  M1 (DEP) A1
				<b>Total 3 marks</b>

<b>17</b>	$x^2 + 9 = (x + y)^2$		4	M1
	$x^2 + 9 = x^2 + 2yx + y^2$ (expanding)			M1 (DEP)
	$9 - y^2 = 2yx$ (gathering terms)			M1 (DEP)
		$x = \frac{9 - y^2}{2y}$ , $\frac{y^2 - 9}{-2y}$ , (oe)		A1
				<b>Total 4 marks</b>

<b>18</b> a	$\frac{6.9 + 7.5}{2}$		2	M1
		7.2		A1
b	$\frac{5.9 + 6.3 + \dots}{8} = \frac{58.4}{8}$		2	M1
		7.3		A1
				<b>Total 4 marks</b>

<div>19</div> <div>ai</div>		$y = -x$ (line going through $(-4, 4)$ and $(1.5, -1.5)$ )	<div>4</div>	<div>B1</div> <div>Penalise missing label once only in part (a) (ie deduct 1<sup>st</sup> mark)</div>
<div>aii</div>		$y = x + 2$ (line going through $(-3, -1)$ and $(1, 3)$ )		<div>B1</div>
<div>b</div>		$B(0, -3)$		<div>B1</div> <div><math>B</math> and <math>C</math> interchanged B1 B0</div>
		$C(-3, -1)$		<div>B1</div> <div>Accept points (with coords) clearly identified on the diagram</div>
	<div>Total 4 marks</div>			

20	$256 = \frac{k}{(1/2)^3}$			M1
	$k = 32$			A1
	$\frac{4}{27} = \frac{"k"}{x^3} \quad (x^3 = 216)$			M1 (DEP)
	OR $\frac{x^3}{\frac{1}{8}} = \frac{256}{\frac{4}{27}} \text{ (oe)}$			
	OR $\frac{x^3}{\frac{1}{8}} = \frac{256}{\frac{4}{27}} \text{ (oe)}`$			M1 A1 M1 (DEP)``
		$x = \text{awrt } 6.00$		A1
				<b>Total 4 marks</b>

21	a		2, 4, 8, 16  OR $2^1, 2^2, 2^3, 2^4$	2	B2 Allow B1 for 1, 2, 4, 8 <b>OR</b> 2, (-1eeoo) 4, 6, 8
	b	$\frac{2^{500}}{2^{488}}$		3	M1
	c		$2^{12}$ or 4096 or 4093 (if working to 3sf)		A1
			$8^4$ (cao)		A1
					<b>Total 5 marks</b>

22	a	$5t^2 - 9t - 2$ (oe)		2	B2 Allow ISW (-1 eooo)
	b	" $5t^2 - 9t - 2$ " = 0		3	M1
		Attempt to factorise/solve a trinomial quadratic should be $(5t + 1)(t - 2)$ OR $\frac{9 \pm \sqrt{81 - (4 \times 5 \times -2)}}{2 \times 5}$			M1 (DEP)
			t=2		A1
					Total 5 marks

23	a		$90^\circ$	1	B1
	b		$\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$	2	B2 (-1 eeo)
	c		$\begin{pmatrix} -1 \\ -6 \end{pmatrix}$	2	B1 ft    Ft from diagram only <b>and</b> B1 ft    added shape must be correct.
					<b>Total 5 marks</b>



24 a	$(6x^2 + kx - 6)(x - 4) = 6x^3 + (k - 24)x^2 - (6 + 4k)x + 24$ $= 6x^3 + (k - 24)x^2 - (6 + 4k)x + 24$ $-26 = -4k - 6 \quad \text{or} \quad -19 = k - 24$ <p><b>OR</b></p> $6x^3 - 24x^2 + 5x^2 - 20x - 6x + 24 \quad (\text{expanding brackets with } k = 5)$ <p><b>OR</b></p> $x - 4 \overline{) 6x^3 - 19x^2 - 26x + 24} \quad (\text{division correct})$ <p><b>OR</b></p> <p>Synthetic division:</p> $\begin{array}{r rrrr} 4 & 6 & -19 & -26 & +24 \\ & & 24 & 20 & -24 \\ \hline & 6 & 5 & -6 & 0 \end{array}$		2	M1 Algebra must be correct for the M mark
		$k = 5$ (cc)		A1
b	Attempt to factorise quadratic $6x^2 + 5x - 6$	$(2x + 3)(3x - 2)$	2	M1
		$(x - 4)(2x + 3)(3x - 2)$		A1
	Total 5 marks			

25	a	$\frac{120}{360} \times 2 \times \pi \times 14$		2	M1 Penalise incorrect rounding only once in the question
			29.3 cm		A1
	b	$\frac{"29.3"}{2 \times \pi}$  Alternative: (Area of sector $OABC = 205 \text{ cm}^2$ )  $\therefore \pi \times r_{\text{Cone}} \times 14 = "205"$  $\therefore r_{\text{Cone}} = \frac{"205"}{\pi \times 14}$		2	M1
			4.66 cm (from 29.3), 4.67 cm (accept 14/3 which is exact)		A1
	c	$\sqrt{14^2 - ("4.66")^2}$		2	M1
			13.2 cm		A1
Total 6 marks					

26 a			3	B3 -1 penalty for each incorrect pair
b	$\frac{2}{3} \times \frac{4}{5}$		2	M1
		$\frac{1}{3}p + \frac{2}{3} \times \frac{4}{5} = \frac{37}{60}$ (oe)		A1
c	$\frac{1}{3}p = \frac{37}{60} - \frac{2}{3} \times \frac{4}{5}$ (gathering terms in $p$ ) OR $p = \frac{37}{20} - \frac{2}{3} \times \frac{4}{5} \times 3$		2	M1 Accept $\frac{1}{3}(1-p) = \frac{37}{60} - \dots$ for (M1)
		$p = \frac{1}{4}$ (o.e.)		A1 No retrospective award of A1 from (b) in (c)
				<b>Total 7 marks</b>

27	a	$EF^2 = (\sqrt{135})^2 - (\sqrt{35})^2$			M1
			$EF = \text{awrt} 10.0 \text{ cm}$		A1
	b	$AC: CF \times AF = FD^2$ gives $(10 - 2.5) \times ((10 - 2.5) + AC) = (\sqrt{135})^2$ $56.25 + 7.5 \times AC = 135 \quad (AC = 10.5)$ OR $(10 - 2.5) \times (10 + AE) = (\sqrt{135})^2$			M1
			$75 + 7.5 \times AE = 135$		A1
			$AE = 8 \text{ cm}$ (correctly shown)		A1
	c	$EB \times \sqrt{35} = 8 \times 2.5$			M1
			3.38		A1    Apply 3 sf penalty here.
					<b>Total 7 marks</b>

28	<b>Method without need to use <i>BD</i>:</b>		6	
	$\angle BAC = 90 - 62$			M1
		$\angle BAC = 28$		A1
	$\frac{40}{\sin 54} = \frac{BC}{\sin 28}$			M1
		$BC = 23.212....$		A1
	$\text{Area} = \frac{1}{2} \times 40 \times BC \times \sin(62 + 36)$ $\text{Area} = \frac{1}{2} \times 40 \times 23.2119... \sin(98)$			M1 (DEP)
		460 (459.720...) cm <sup>2</sup>		A1

28	<b>Right Angled Triangle Method</b>		6	
	$\text{Area} = \frac{1}{2} \times BD \times AC :$ $\frac{BD}{40} = \sin 28$			M1
		$BD = \text{awrt } 18.8 \text{ (18.77886...)}$		A1
	Correct Pythag/trig to find $AD$ or $DC$			M1
		$AD = \text{awrt } 35.3, 35.4 \text{ OR}$ $DC = \text{awrt } 13.6, 13.7$		A1
	$\text{Area} = \frac{1}{2} \times 18.77886... \times (35.3179 + 13.6436...)$			M1 (DEP)
		<b>Area = 459, 460, 461</b>		A1

28	Methods NOT using 90° triangle (1)		6	
	$\text{Area} = \frac{1}{2} \times AB \times BC \times \sin 98$ $\frac{BD}{40} = \sin 28$			M1
		$BD = \text{awrt } 18.8 \text{ (18.77886...)}$		A1
	$\frac{"18.77886"}{BC} = \sin 54$			M1 (DEP)
		$BC = \text{awrt } 23.2$		A1
	OR			M1
	$\angle BAD = 180 - (90 + 62)$			
		$\angle BAD = 28$		A1
	$\frac{40}{\sin 54} = \frac{BC}{\sin 28}$			M1
		$BC = \text{awrt } 23.2$		A1
	$\text{Area} = \frac{1}{2} \times 40 \times "23.2" \times \sin 98$			M1 (DEP)
		<b>Area = 459, 460, 461</b>		A1

28	<b>Methods NOT using 90° triangle (2)</b>		6	
	$\text{Area} = \frac{1}{2} \times AB \times AC \times \sin 28:$ $\angle ABC = 62 + [180 - (90 + 54)]$			M1
		$\angle ABC = 98$		A1
	$\frac{40}{\sin 54} = \frac{AC}{\sin 98}$			M1
		$AC = \text{awrt } 49.0$		A1
	$\text{Area} = \frac{1}{2} \times 40 \times "49.0" \times \sin 28$			M1 (DEP)
		<b>Area = 459, 460, 461</b>		A1

28	<b>Methods NOT using 90° triangle (3)</b>		6	
	$\text{Area} = \frac{1}{2} \times BC \times AC \times \sin 54$ $\frac{40}{\sin 54} = \frac{BC}{\sin 28}$			M1
		$BC = \text{awrt } 23.2$		A1
	$\frac{40}{\sin 54} = \frac{AC}{\sin 98}$			M1
		$AC = \text{awrt } 49.0$		A1
	$\text{Area} = \frac{1}{2} \times "23.2" \times "49.0" \times \sin 54$			M1 (DEP)
		<b>Area = 459, 460, 461</b>		A1

