Mark Scheme (Results)

January 2018

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

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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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

Question	Working	Answer	Mark	Notes
1	$\frac{48.6}{360}\times 3\ 690\ 000$ oe	498 150	2	M1 A1
2	Prime factorisation of either 84 **or** 40 $\left[\begin{array}{l}84=2^2\times3\times7\\40=2^3\times5\end{array}\right]$ (LCM = $3\times7\times(2\times2)\times2\times5$) **OR** 84 = 4 × 21 **and** 40 = 4 × 10 oe (as 21 and 10 have no common factors) **(**so LCM = $4\times21\times10=840$) **OR** At least 5 multiples of 84 **and** 40 84, 168, 252, 336, 420,... 40, 80, 120, 160, 200,...	840 840 840	2 {2} {2}	M1 factors may be on the end of factor trees or on factor 'ladders' cao A1 {M1} {A1} {M1} {A1}
3	$\frac{50}{12}-\frac{27}{12}$ oe, eg $\frac{100-54}{24}$ **or** $2\frac{2}{12}-\frac{3}{12}$ oe $\frac{50}{12}-\frac{27}{12}=\frac{23}{12}=1\frac{11}{12}$ **or** $\frac{100-54}{24}=\frac{46}{24}=\frac{23}{12}(\text{or}\ 1\frac{22}{24})=1\frac{11}{12}$ oe **or** $2\frac{2}{12}-\frac{3}{12}=2-\frac{1}{12}=1\frac{11}{12}$	shown	2	M1 for fractions with a common denominator A1 NB use of decimals gains no marks

Question	Working	Answer	Mark	Notes	
4	$4n - 9 = 117$ **OR** sequence written out in full; $-5, -1, 3, 7, ...111,\ 115,\ 119$ **OR** 31st term = 115 and 32nd term = 119	No oe and $n = 31.5$ oe **OR** No and correct sequence showing there is no 117 **OR** No and the sequence goes 115, 119 (and misses 117)	2	M1 A1	correct equation or correct sequence listed to include numbers either side of 117 or calculating the 31st and 32nd term
5	$\frac{68}{360} \times 2 \times \pi \times 14$ oe	16.6 cm	2	M1 A1	awrt 16.6
6	$180^o - 165^o = 15^o$ $\frac{360^o}{"15^o"}$ **OR** $165 = \frac{180(n-2)}{n} = \frac{90(2n-4)}{n} \Rightarrow 165n = 180n - 360$	24 24	2 {2}	M1 A1 {M1} {A1}	for finding exterior angle and dividing 360 by this. a correct equation using 165

Question	Working	Answer	Mark	Notes
7	$-1\frac{1}{2} < x < .....$ **or** $x > -1\frac{1}{2}$ (or $-1\frac{1}{2} < x$) **or** $..... < x < 3$ **or** $x < 3$ $-3 < 2x < 6$ **or** $2x > -3$ **or** $2x < 6$ $-1\frac{1}{2} < x < 3$ **or** $x > -1\frac{1}{2}$ (or $-1\frac{1}{2} < x$) and $x < 3$	$-1, 0, 1, 2$	3	M1 solving either inequality or both ends correct for $2x$ or values of -1.5 and 3 not written as inequalities M1 for solving both inequalities A1 SCB1 if no M marks awarded then award this mark for 3 correct values and no more than one incorrect
8 (a)		340 000	1	B1
(b)	e.g. $\frac{45600}{136} \times 1.18$, $4560 \div \frac{136}{1.18}$ oe	395.65	2	M1 A1 allow answers in range 395.6 – 396
9	$2^5 = 2^{2(x+4)}$ or $5 = 2(x+4)$ or $5 = 2x + 8$ or $4^{\frac{5}{2}} = 4^{x+4}$ oe $2x = 5 - 8(2x = -3)$ **OR** $8 - 5 = -2x(3 = -2x)$ **OR** $\frac{5}{2} = x + 4$	$x = -\frac{3}{2}$	3	M1 M1 A1 oe
10	e.g. $x \leqslant 7 - y$, $y \leqslant 7 - x$ oe e.g. $x - y \geqslant 2$, $y - x \leqslant -2$, $x - 2 \geqslant y$ oe	$y \geqslant 1$ $x + y \leqslant 7$ $y \leqslant x - 2$	3	B1 accept $y > 1$ B1 accept $x + y < 7$ (oe) B1 accept $y < x - 2$ (oe)

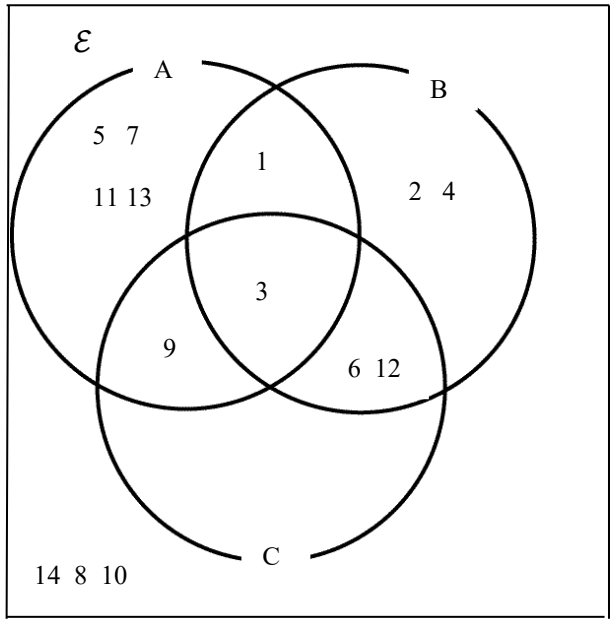
Question	Working	Answer	Mark	Notes
11 (a)		4	1	B1
(b)	$\frac{9+2+4+6+4+4+7+10+3+9}{10}=\left(\frac{58}{10}\right)$	5.8	2	M1 Allow one slip in numerator, but must have a final answer A1
12 (a)		209.2	1	B1 or 2.092×10^2
(b)	2.586643777×10^7	2.59×10^7	2	M1 for 2.59×10^n or $2.5(866...)\times10^7$ or 25 900 000 A1
13 (a)		$\frac{15}{20}$ oe	1	B1
(b)	$\frac{8}{20}\times\frac{7}{19}+\frac{7}{20}\times\frac{6}{19}+\frac{5}{20}\times\frac{4}{19}\left(=\frac{118}{380}\right)$ **or** $1-(\frac{8}{20}\times\frac{12}{19}+\frac{7}{20}\times\frac{13}{19}+\frac{5}{20}\times\frac{15}{19})$ oe	$\frac{59}{190}$	2	M1ft their 20 from (a) (SCM1 for $\frac{8}{20}\times\frac{8}{20}+\frac{7}{20}\times\frac{7}{20}+\frac{5}{20}\times\frac{5}{20}\left(=\frac{69}{200}\right)$) A1 oe allow 0.31 or better

Question	Working	Answer	Mark	Notes
14	Ratio of length of sides of *ABCD* : *WXYZ* = 8 : 6 or 4 : 3 oe (Area of *WXYZ* =) $\frac{3^2}{4^2}\times 36$ oe	20.25	3	M1 M1 A1 allow 20.3 from correct working
15	e.g. $\_\ 6x + 5y = 37$ **OR** $15x - 10y = -20$ $\underline{6x - 4y = -8}$ $+\ \underline{12x + 10y = 74}$ $9y = 45$ $27x = 54$ oe **OR** $x = \frac{2y-4}{3}$ and $6\left(\frac{2y-4}{3}\right)+5y=37$ oe **OR** $y = \frac{37-6x}{5}$ and $3x-2\left(\frac{37-6x}{5}\right)=-4$ oe e.g. $3\times 2-2y=-8$ or $6\times 2+5y=37$ or $3x-2\times 5=-4$ or $6x+5\times 5=37$ **OR** e.g. $\frac{3x+4}{2}=\frac{37-6x}{5}$ (oe) $5(3x+4)=2(37-6x) \Rightarrow 27x=54$ e.g. $3\times 2-2y=-8$ or $6\times 2+5y=37$ or $3x-2\times 5=-4$ or $6x+5\times 5=37$	$x=2$ $y=5$ $x=2$ $y=5$	3	M1 for coefficient of *x* or *y* is the same in both equations and correct operation to eliminate selected variable (condone one arithmetic error) or for correct rearrangement of one equation followed by correct substitution in the other. M1 (Dep) for substituting their found value into one of the equations (or use of elimination or substitution again) A1 dep on M1 {M1} Rearranges both equations to make *y* (or *x*) the subject and equates their equations as far as $27y = 135$ or $27x = 54$ oe. Condone one arithmetic error in equations. {M1} (Dep) for substituting their found value into one of the equations (or starting again) {A1} dep on M1

Question	Working	Answer	Mark	Notes
16	$\frac{6-5x}{x} = 6x^{-1} - 5$	$8x^3 - 6x^{-2}$ OR $8x^3 - \frac{6}{x^2}$	3	M1 M1 for $8x^3$ or $-6x^{-2}$ oe A1
17	$3u + 6tu = 5 - 4t$ $6tu + 4t = 5 - 3u$ $t(6u + 4) = 5 - 3u$	$t = \frac{5-3u}{6u+4}$	4	M1 multiply by denominator and expand correctly M1 isolate terms in t one side and other terms the other side (allow one sign error for this mark) M1 factorise t outside bracket (ft one sign error) A1 oe must see $t =$
18	$p \times 2p - (3p - 2) \times -4$ (= 46) oe $2p^2 + 12p - 54$ (= 0) **OR** $p^2 + 6p - 27$ (= 0) $(2p + 18)(p - 3)$(=0) **OR** $(p + 9)(2p - 6)$(=0) **OR** $(p + 9)(p - 3)$(=0)	$p = -9,\ 3$	4	M1 correct expression for determinant A1 forms correct 3TQ M1 attempts to solve *their* 3TQ - award mark if 2 of 3 terms correct from factorisation (e.g.$(p - 9)(p + 3)$) A1

Question	Working	Answer	Mark	Notes
19	$BEF = EBF = \frac{(180-70)}{2} = 55^o$ or $BEF = EBF = \frac{110}{2} = 55°$	55^o	4	M1 for angle *BEF* and/or angle *EBF* = 55° stated or labelled on the diagram A1 $x = 55°$ B1 for isosceles triangle B1 for alternate angles or allied (co-interior) or corresponding angles oe
20 (a)	$\tan 53^\circ = \frac{8}{AB}$ or $AB = \frac{8}{\tan 53^o}$ oe	6.03	2	M1 a correct equation containing *AB* oe A1 awrt 6.03
(b)	$V = \frac{1}{2} \times '6.03' \times 12 \times 8 = 289.3647...$	289	2	M1 ft their answer to (a) A1 awrt 289
21 (a)	$\overrightarrow{XY} = -\begin{pmatrix}2\\5\end{pmatrix} + \begin{pmatrix}-2\\7\end{pmatrix} = \begin{pmatrix}-4\\2\end{pmatrix}$	$\begin{pmatrix}-4\\2\end{pmatrix}$	2	M1 for $-\begin{pmatrix}2\\5\end{pmatrix} + \begin{pmatrix}-2\\7\end{pmatrix}$ oe A1
(b)	$\left\lvert\overrightarrow{XY}\right\rvert = \sqrt{('-4')^2 + ('2')^2}$	$\sqrt{20}$ or $2\sqrt{5}$	2	M1ft uses Pythagoras theorem on their $\overrightarrow{XY}$ (allow 4 and 2 used) A1 cao
(c)	$\frac{1}{\sqrt{20}}\begin{pmatrix}-4\\2\end{pmatrix} = \frac{\sqrt{5}}{5}\begin{pmatrix}-2\\1\end{pmatrix}$ OR $\frac{\sqrt{5}}{5}\begin{pmatrix}2\\-1\end{pmatrix}$	$\frac{\sqrt{5}}{5}\begin{pmatrix}-2\\1\end{pmatrix}$ OR $\frac{\sqrt{5}}{5}\begin{pmatrix}2\\-1\end{pmatrix}$	1	B1 ft even if not simplified

Question		Working	Answer	Mark	Notes
22	(a)	$y = \frac{k}{x^3} \Rightarrow \frac{32}{27} = \frac{k}{\left(\frac{3}{2}\right)^3}$ $k = 4$	$y = \frac{'4'}{x^3}$	3	M1 a correct substitution into a correct equation A1 cao A1
	(b)	$y = \frac{4}{0.5^3} = 32$	32	1	B1 cao
	(c)	$x^3 = \frac{4 \times 128}{125}$	1.6	2	M1 for substitution and isolating x^3 A1 oe
23	(a)	For missing horizontal side = 7 (cm) or missing vertical side = 5 (cm) $(x + 4)(x + 7) – 7(x – 1) = 131$ **or** $x(x + 4) + 5 \times 7 = 131$ **or** $5(x + 7) + x(x – 1) = 131$ $x^2 + 11x + 28 – 7x + 7 = 131 \Rightarrow x^2 + 4x – 96 = 0$ **or** $x^2 + 4x + 35 = 131 \Rightarrow x^2 + 4x – 96 = 0$ **or** $5x + 35 + x^2 – x = 131 \Rightarrow x^2 + 4x – 96 = 0$	shown	3	B1 5 or 7 stated, used or shown on diagram M1 for a correct equation for the area of shape **S** A1 for expanding and simplifying correctly
	(b)	± 8 **or** ± 12 $x = 8$ $P = 8 + (8 + 4) + (8 + 7) + 5 + 7 + (8 – 1) = 54$	54	3	M1 A1 may be seen clearly used for the perimeter B1

Question	Working	Answer	Mark	Notes
24 (a)			3	B3 all 14 values correctly placed B2 for 1, 2 or 3 errors B1 for 4, 5 or 6 errors Where an error is a number in the wrong place, a missing number a repeated number
(b)		1, 2, 3, 4, 6, 9, 12	1	B1 ft
(c)		1, 3	1	B1 ft
(d)		3	1	B1 ft

Question	Working	Answer	Mark	Notes
25 (a)		A tangent to a circle makes a right angle with the radius at that point oe	1	B1 minimum: angle between tangent and radius (or diameter)
(b) (i)		49° Alternate Segment Theorem **OR** $\angle$ subtended by an arc at the centre is twice the $\angle$ subtended by the arc at the circumference AND Isos Δ	2	B1 B1 correct reason(s) for method used
(ii)	$\angle AOC = 98^\circ$ and $\angle OAC = 41^\circ$ e.g. The angle at the centre of a circle is double the angle at the circumference Base angles in an isosceles triangle Alternate segment theorem **OR** Alternate Segment Theorem Angles on a straight line The angle at the centre of a circle is double the angle at the circumference Base angles in an isosceles triangle Angles in a quadrilateral	35°	3	M1 may be on diagram B1 for two correct reasons for method used. A1 final correct answer

Question	Working	Answer	Mark	Notes
26 (a)	$a = \frac{20}{10}$	2	2	M1 A1
(b)	Dist = $\frac{20}{2}(45+30)$ **or** $\frac{1}{2}\times'10'\times 20+30\times 20+\frac{1}{2}\times 5\times 20$ (100 + 600 + 50)	750	2	M1 A1
(c)	Average speed = $\frac{'750'}{45}$ (oe)	$\frac{50}{3}$	2	M1 ft A1 oe Accept 16.7 or better

Question		Working	Answer	Mark	Notes
27	(a)		$\{y : y \geqslant 4\}$ Accept $y \geqslant 4$ or $g(x) \geqslant 4$	1	B1
	(b)		3	1	B1 Allow $x \neq 3$ oe
	(c)	$x = \frac{y}{y-3}$ oe $xy - 3x = y$ $xy - y = 3x$ **or** $y = \frac{x}{x-3}$ $xy - 3y = x$ $xy - x = 3y$ **or** $\frac{x}{x-3} = 5$	$\frac{15}{4}$	4	M1 multiplies by denominator and gathers terms in y (or x) on one side of the equation **or** equates h to 5
		$y = \frac{3x}{x-1} \Rightarrow h^{-1}(x) = \frac{3x}{x-1}$ **or** $x = 5x - 15$ oe			M1 completes finding inverse function in terms of x **or** multiplies 5 by denominator
		$h^{-1}(5) = \frac{3\times5}{5-1} = \frac{15}{4}$ **or** $4x = 15$ oe			M1 substitutes $x = 5$ into $h^{-1}(x)$ **or** simplifies equation with x terms one side and number terms the other
					A1 oe
	(d)	$ff(x) = 2 + (2 + x)$	$4 + x$	1	B1