## P <br> Pearson Edexcel

## Mark Scheme (Results)

January 2022

Pearson Edexcel International GCSE In Mathematics B (4MB1)
Paper 02

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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
- cao - correct answer only
- ft - follow through
- isw - ignore subsequent working
- SC - special case
- oe - or equivalent (and appropriate)
- dep-dependent
- indep - independent
- awrt - answer which rounds to
- 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 the final answer is wrong 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.
If a candidate misreads a number from the question. Eg. Uses 252 instead of 255; method marks may be awarded provided the question has not been simplified. Examiners should send any instance of a suspected misread to review.
If there is a choice of methods shown, then award the lowest mark, unless the subsequent working makes clear the method that has been used.
If there is no answer achieved then check the working for any marks appropriate from the mark scheme.

## - 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 to another.

| Question | Working | Answer | Mark |  | Notes |
| :--- | :--- | :--- | :---: | :---: | :--- |
| 1 (a) |  | $2.48 \times 10^{8}$ | 1 | B1 | cao |
| (b) |  | 0.000256 | 1 | B1 | cao |
| (c) | Numerator of $2.37 \times 10^{60}$ or $23.7 \times 10^{107}$ oe <br> or an answer in the form $1.58 \times 10^{n}$ or $m \times 10^{108}$ |  | 3 | M1 | Allow eg $23.7 \times 10^{59}$ or $(25-1.3) \times 10^{59}$ <br> Implied by a correct single value in any form |
|  | $15.8 \times 10^{107}$ or $158 \times 10^{106}$ oe |  |  | A1 | A correct single value seen in their working but <br> need not be in standard form. |
|  |  | $1.58 \times 10^{108}$ |  | A1 |  |


| Question | Working | Answer |  | Mark | Notes |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 2(a) | $\frac{9+8+7+6+10+a+7}{7}=8 \text { or } \frac{a+47}{7}=8$ |  | 2 | M1 | Correct method to find the mean no errors. |
|  |  | 9 |  | A1 |  |
| (b) | 6, 7, 7, 8, 9, "9", 10 |  | 2 | M1 | For ordering allow correct ordering using their value for $a$. This is often seen in the text of the question |
|  |  | 8 |  | A1ft | Answer must follow their value for part (a) If $a \geqslant 8$ the median is 8 <br> If $a \leqslant 7$ the median is 7 <br> If there is no value of $a$ found in part(a) the median is 7.5 <br> Check that a median of 8 does not come from calculating the mean |
| (c) | $34 \times 49-11 \times 72 \quad[=1666-792=874]$ |  | 3 | M1 | A correct method to find the total age of the passengers who are not pensioners. |
| $\frac{" 874 "}{34-11} \text { or } \frac{" 874 "}{23}$ |  |  |  | M1dep | Dep on previous M being awarded. A correct method to find the mean age of the passengers who are not pensioners. |
|  |  | 38 |  | A1 |  |
|  |  |  |  |  | Total 7 marks |


| Question | Working | Answer | Mark |  | Notes |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 3 (a) | $y=-x$ drawn or 2 points correct |  | 2 | M1 |  |
|  |  | Correct triangle |  | A1 | $(-1,-4)(-5,-2)(-7,-8)$ |
| (b) | 2 points correct or $3 x$ coordinates correct or $3 y$ coordinates correct |  | 2 | M1 |  |
|  |  | Correct triangle |  | A1 | $(-7,3)(-5,-1)(-1,5)$ |
| (c) |  | enlargement | 3 | B1 |  |
|  |  | SF-0.5 |  | B1 |  |
|  |  | Centre (6, -1 ) |  | B1 |  |




There may be other combinations used. If there is another method use that merits marks send to review

$$
\overrightarrow{A C}=-\frac{2}{3} \mathbf{a} \text { and } \overrightarrow{A C}= \pm k\left("-\mathbf{a}+\mathbf{b}^{\prime \prime}\right) \pm m\left("-\frac{1}{3} \mathbf{a}+\frac{2}{5} \mathbf{b} "\right)
$$

$$
\text { or }-\frac{2}{3} \mathbf{a}= \pm k("-\mathbf{a}+\mathbf{b} ") \pm m\left("-\frac{1}{3} \mathbf{a}+\frac{2}{5} \mathbf{b} "\right)
$$

$$
\overrightarrow{O E}=\mathbf{a} \pm k("-\mathbf{a}+\mathbf{b} ") \text { and } \overrightarrow{O E}=\frac{1}{3} \mathbf{a} \pm m\left("-\frac{1}{3} \mathbf{a}+\frac{2}{5} \mathbf{b} "\right)
$$

$$
\text { or } \mathbf{a} \pm k("-\mathbf{a}+\mathbf{b} ")=\frac{1}{3} \mathbf{a} \pm m\left("-\frac{1}{3} \mathbf{a}+\frac{2}{5} \mathbf{b} "\right)
$$

$$
\overrightarrow{C E}=\frac{2}{3} \mathbf{a} \pm k("-\mathbf{a}+\mathbf{b} ") \text { and } \overrightarrow{C E}=m\left("-\frac{1}{3} \mathbf{a}+\frac{2}{5} \mathbf{b} "\right)
$$

$$
\text { or } \frac{2}{3} \mathbf{a} \pm k("-\mathbf{a}+\mathbf{b} ")=m\left("-\frac{1}{3} \mathbf{a}+\frac{2}{5} \mathbf{b} "\right)
$$

$\overrightarrow{A O}=-\mathbf{a}$ and $\overrightarrow{A O}= \pm k("-\mathbf{a}+\mathbf{b} ") \pm q\left(-\frac{1}{3} \mathbf{a}+\frac{2}{5} \mathbf{b}\right)-\frac{2}{5} \mathbf{b}$

$$
\text { or } \mathbf{a}= \pm k("-\mathbf{a}+\mathbf{b} ") \pm m\left(" \frac{1}{3} \mathbf{a}-\frac{2}{5} \mathbf{b} "\right)-\frac{2}{5} \mathbf{b}
$$



| Question | Working | Answer |  | Mark | Notes |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 7(a) | $\begin{aligned} & \angle O D C=90-38[=52] \\ & \text { Or } \angle C A D=38 \text { or } \angle D B C=38 \\ & \text { Or } \angle A D E=180-(180-86+38)[=48] \end{aligned}$ |  | 6 | M1 | Correct method to find $\angle O D C$ or correct angle for $\angle C A D$ May be seen on diagram. If it is not on the diagram it must be clearly labelled |
|  | $\begin{aligned} & \angle O D A \text { or } \angle O A D=180-86-" 52 "[=42] \text { or } 90-48[=42] \\ & \text { or } \angle C O D=76 \\ & \text { or } \angle A B D=86-38[=48] \end{aligned}$ |  |  | M1 | Correct method to find $\angle O D A, \angle O A D$ or $\angle C O D$ May be seen on diagram, <br> If it is not on the diagram it must be clearly labelled |
|  | $\begin{aligned} & \angle A O D=180-2 \times 42 "[=96] \\ & \text { or } \angle A O D=86 \times 2-" 76 "[=96] \\ & \text { or } \angle A O D=48 \times 2[=96] \end{aligned}$ |  |  | M1 | Correct method to find $\angle A O D$ May be seen on diagram <br> If it is not on the diagram it must be clearly labelled Allow $\angle O$ for $\angle A O D$ |
|  | $\frac{" 96 "}{360} \times 2 \pi r=0.8 \pi \text { oe or } \frac{" 96 "}{360} \times 2 \times \pi \times 1.5$ |  |  | M1 | Allow without $\pi$ <br> Must use "their $\angle A O D$ "from diagram or clearly labelled |
|  | $r=\frac{0.8 \pi \times 360}{" 96 " \times 2 \pi} \text { oe or } \frac{" 96 "}{360} \times 2 \times \pi \times 1.5=0.8 \pi$ |  |  | M1 | Allow without $\pi$ in. Must use "their $\angle A O D$ "from diagram or clearly labelled |
|  | Angle between tangent and radius (diameter) is $90^{\circ}$ <br> Alternate segment theorem <br> Opposite angles of a cyclic quadrilateral <br> Angle at the centre is $2 \times$ (double) angle at circumference / <br> angle at circumference is $1 / 2$ angle at centre <br> Base angles in an isosceles triangle <br> Angles in a triangle add to $180^{\circ}$ <br> Angles on a straight line add to $180^{\circ}$ | 1.5 |  | A1 shown | Need all of the previous method marks and a fully correct solution with at least two relevant reasons for their working. Minimum needed is the words underlined (allow abbreviations if clear). If verifying then must state the radius is therefore 1.5 e.g. $r=1.5$ rather than just 1.5 |
| (b) | [Area $=$ ] $\pi \times 1.5^{2}$ |  | 2 | M1 |  |
|  |  | 7.07 |  | A1 | Awrt 7.07 |


| Question | Working | Answer | Mark |  | Notes |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 8(a) |  | 3 | 3 | $\begin{aligned} & \text { B3 } \\ & \text { B2 } \\ & \text { B1 } \end{aligned}$ | All 8 correct 6 or 7 correct 4 or 5 correct |
| We do not ft if they have blanks for a region needed for that part of the question but correct answers gain the marks |  |  |  |  |  |
| (b)(i) |  | 3 | 3 | B1 | Correct answer or Ft their Venn diagram ie the number outside of the circles. |
| (ii) | "15" + "6" + "11" + "3" + "13" or 33 + "15" | 48 |  | B1 | Correct answer or Ft their Venn diagram. |
| (iii) | 66 - "5" or "3"+"3"+"13"+"11"+"6"+"15"+"10" | 61 |  | B1 | Correct answer or Ft their Venn diagram. |
| (c)(i) |  | 0 | 1 | B1 | Mark the final answer, ignore working. We will allow 0 or $\frac{0}{29}$ as the final answer |
| (ii) | $\frac{" 11 "+" 3 "}{29} \text { or } \frac{" 11 "+" 3 "}{110 "+" 11 "+3 "+" 5 "}$ |  | 2 | M1 | Correct answer or Ft their Venn diagram but the numerator must be less than the denominator |
|  |  | $\frac{14}{29}$ |  | A1 |  |





Total 13 marks




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