# Mark Scheme (Results)

## November 2020

Pearson Edexcel International GCSE
In Mathematics B (4MB1)
Paper 01R

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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 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.
  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 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 to another.

| Question | | Working | Answer | Mark | Notes |
|---|---|---|---|---|---|
| **1** | | $\frac{2563}{11}\times 13$ **and** $\frac{2563}{11}\times 8$ **or** $\frac{2563}{11}\times 5$ | | M1 | |
| | | | 1165 | A1 | |
| | | | | | ***Total 2 marks*** |
| **2** | | $\frac{8(2x+3)^2}{4(2x+3)}$ or $\frac{2(2x+3)^2}{(2x+3)}$ or $\frac{8(2x+3)}{4}$ | | M1 | Factorising the denominator or dividing by 4 or cancelling a bracket. Implied by a correct answer |
| | | | $4x + 6$ | A1 | or equivalent, for example $2(2x + 3)$ |
| | | | | | ***Total 2 marks*** |
| **3** | | $\frac{16}{3}$ and $\frac{13}{5}$ or $\frac{16}{3}$ and $\frac{5}{13}$ oe | | M1 | |
| | | $\frac{16}{3}\times\frac{5}{13}=\frac{80}{39}$ or e.g. $\frac{80}{15}\div\frac{39}{15}=\frac{80}{39}$<br>Allow $\frac{16}{3}\div\frac{13}{5}=\frac{80}{39}$ | | M1 | Must multiply both correctly. Or for $\frac{16}{3}\times ...=...$, $...\times\frac{5}{13}=...$<br>Note that $\frac{16}{3}\times\frac{5}{13}=2\frac{2}{39}$ is M1M1A0 |
| | | | $2\frac{2}{39}$ | A1 | Must be given as a mixed number |
| | | | | | ***Total 3 marks*** |
| **4** | | $\frac{36}{60}$ or 3.6 or $3\frac{36}{60}$<br>or $3\times 60+36$ [=216] | | M1 | |
| | | $\frac{11.52}{"3.6"}$ or $\frac{11.52}{"216"}\times 60$ | | M1 | For using distance ÷ time. Allow 11520 instead of 11.52, e.g. $\frac{11520}{"3.6"}\div 1000$ |
| | | | 3.2 | A1 | |
| | | | | | ***Total 3 marks*** |

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| **5** | | $45500\times1.055\left[=48002.5\right]$ | | M1 | |
| | | $"48002.5"\times1.0125^2$ | | M1 | M2 only if after 49210 working out a third year e.g. 49825.1… |
| | | | 49 210 | A1 | Awrt (For reference: 49210.06289…) |
| | | | | | ***Total 3 marks*** |
| **6** | **(a)** | $y=\frac{3x+5}{2}$ | | M1 | Attempt to re-arrange to make *y* the subject – allow sign errors only |
| | | | $\frac{3}{2}$ | A1 | Or equivalent (e.g. 1.5) – M1A0 for $\frac{3}{2}x$<br>Condone for full marks those that have the correct gradient but incorrect constant term $\left(\text{e.g. } y=\frac{3x-5}{2}\Rightarrow m=\frac{3}{2}\right)$ |
| | **(b)** | | $\left(0,\frac{5}{2}\right)$ | B1 | |
| | | | | | ***Total 3 marks*** |
| **7** | | $\frac{1}{10}\times\frac{1}{a}\times\frac{2}{b}$<br>where $a$ = 9 or 10 and $b$ = 8 or 10 | | M1 | Condone if other terms seen (e.g. from considering other possible orders of the letters P, A and L) but not if divided by 6 |
| | | $\frac{1}{10}\times\frac{1}{9}\times\frac{2}{8}$ | | A1 | Only (so no other terms seen) |
| | | | $\frac{1}{360}$ | A1 | Accept awrt 0.00278 |
| | | | | | ***Total 3 marks*** |

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| **8** | | $3x+4 \quad 2x-3 \ (>0)$ | | M1 | For solving given quadratic. When factorising must give at least 2 correct terms when multiplied out |
| | | $x<"-\frac{4}{3}", x>"\frac{3}{2}"$ | | M1 | Selecting outside regions for their critical values. Condone non-strict inequalities or 'incorrect' notation (e.g. $-\frac{4}{3}>x>\frac{3}{2}$) |
| | | | $x<-\frac{4}{3}, x>\frac{3}{2}$ | A1 | Must be 2 separate inequalities. Do not accept $-\frac{4}{3}>x>\frac{3}{2}$ but condone 'and' separating the 2 inequalities. Mark final answer. |
| | | | | | ***Total 3 marks*** |
| **9** | | $y=\frac{3x}{2\ x+2}$ and an attempt to clear the fraction $2y\ x+2\ =3x$ | | M1 | |
| | | $x\ 2y-3\ =-4y$ | | M1 | Expand, rearranging and factorise out $x$ (allow sign errors only) |
| | | | $\frac{-4x}{2x-3}$ or $\frac{4x}{3-2x}$ | A1 | |
| | | | | | ***Total 3 marks*** |
| **10** | | $\frac{6-\sqrt{8}}{2+\sqrt{8}}\times\frac{2-\sqrt{8}}{2-\sqrt{8}}$ or $\frac{3-\sqrt{2}}{1+\sqrt{2}}\times\frac{1-\sqrt{2}}{1-\sqrt{2}}$ | | M1 | Or equivalent, for example, $\frac{6-\sqrt{8}}{2+\sqrt{8}}\times\frac{-2+\sqrt{8}}{-2+\sqrt{8}}$ |
| | | $\frac{20-8\sqrt{8}}{-4}$ or $-5+2\sqrt{8}$ or $-5+4\sqrt{2}$ | | M1dep | For multiplying out correctly and simplifying |
| | | | $-5+\sqrt{32}$ | A1 | If $-5+4\sqrt{2}$ with no working, then no marks<br>If $-5+\sqrt{32}$ seen, then SC B1 only |
| | | | | | ***Total 3 marks*** |

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| **11** | | $-3(x-...)^2-...$ | | M1 | Or $a=-3$ |
| | | $-3(x-1)^2-...$ | | M1 | Or $b=-1$ |
| | | | $a=-3$<br>$b=-1$<br>$c=5$ | A1 | Allow $-3(x-1)^2+5$. For those that consider $3x^2-6x-2$ and conclude $3(x-1)^2-5$ then M0M1A0 but allow full marks if then followed by correct answer |
| | | | | | ***Total 3 marks*** |
| **12** | | $\frac{n}{440}=\frac{144}{360}$ | | M1 | Or equivalent |
| | | | 176, 55 | A1 | |
| | | $\frac{209}{440}\times 360[=171]$<br>or $\frac{55}{440}\times 360[=45]$ oe | | M1 | Implied by 45 or 171 |
| | | | Milk 171 or<br>White 45 | A1 | Drawn accurately ± 1° at least 1 labelled correctly (angle and type) |
| | | | | | ***Total 4 marks*** |
| **13** | | $b=\frac{b}{2}+a$ or $\frac{b}{2}=a$ oe | | M1 | |
| | | $\frac{4a+5.5b+8}{5}=10.6$ oe | | M1 | Forming an equation in $a$ and $b$ using the mean e.g. $a+b+\frac{1}{2}b+a+2b+a+3+2b+a+5=10.6$ |
| | | $7.5b=45$ or $15a=45$ | | M1dep | Forming an equation in $a$ or $b$ only – dependent on both previous M marks |
| | | | $a=3, b=6$ | A1 | Correct answers from two correct equations with no working to solve these two equations scores 3 marks.<br>SC B1 both correct answers with no working |
| | | | | | ***Total 4 marks*** |

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| **14** | | $BD = 2\tan 64$ [4.10…] | | M1 | Accept any equivalent form (so $BD$ does not need to be the subject) e.g. $BD = \frac{2}{\tan 26}$ or $\frac{BD}{\sin 64} = \frac{2}{\sin 26}$ |
| | | $\sin 28 = \frac{BD}{BC}$ | | M1 | This mark can be implied by a correct expression for $BC$<br>Or equivalent e.g. $\frac{BC}{\sin 90} = \frac{BD}{\sin 28}$ |
| | | $BC = \frac{"2\tan 64"}{"\sin 28"}$ | | M1dep | Dependent on both previous M marks |
| | | | $BC = 8.7$ | A1 | Accept AWRT to 8.7 (for reference: 8.7345177…) |
| | | | | | ***Total 4 marks*** |
| **15** | **(a)** | $\begin{pmatrix} 9 & -3 \\ -12 & 6 \end{pmatrix} - \begin{pmatrix} 4 & -1 \\ 4 & -4 \end{pmatrix}$ | | M1 | Correct implied subtraction or three correct numbers in the final answer in correct places. |
| | | | $\begin{pmatrix} 5 & -2 \\ -16 & 10 \end{pmatrix}$ | A1 | |
| | **(b)** | $\mathbf{Q} = \begin{pmatrix} 0 & 1 \\ -10 & -17 \end{pmatrix}\begin{pmatrix} 5 & -3 \\ -3 & 2 \end{pmatrix}$ | | M1 | Or general **Q** and **P** inverse to form simultaneous equations,<br>e.g. $\mathbf{Q} = \begin{pmatrix} a & b \\ c & d \end{pmatrix} \Rightarrow \begin{pmatrix} a & b \\ c & d \end{pmatrix}\begin{pmatrix} 2 & 3 \\ 3 & 5 \end{pmatrix} = \begin{pmatrix} 0 & 1 \\ -10 & -17 \end{pmatrix}$<br>$\Rightarrow 2a+3b=0,\quad 3a+5b=1,\quad 2c+3d=-10,\quad 3c+5d=-17$<br>(must have correct inverse for this alternative method) |
| | | | $\begin{pmatrix} -3 & 2 \\ 1 & -4 \end{pmatrix}$ | A1 | |
| | | | | | ***Total 4 marks*** |

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| **16** | | $PK.PJ = PM.PL$ or $5.5\times2.5 = 2\times PL$ | | M1 | |
| | | $PL = 6.875$ or $\dfrac{5.5\times2.5}{2}$ | | A1 | |
| | | Area $= \dfrac{1}{2}\times"6.875"\times2.5\times\sin 74$ | | M1 | Correct use of $0.5ab\sin C$ for their $PL$<br>M0 if angle $LKP$ assumed to be right-angled |
| | | | 8.26 | A1 | Accept AWRT to 8.26 (For reference: 8.260842…) |
| | | | | | ***Total 4 marks*** |
| **17** | **(a)** | | $2.34\times10^{-2}$ | B1 | |
| | **(b)** | | 240 000 | B1 | |
| | © | $0.5\times10^{199}$ or $5\times10^{n}$ $n = 198$ or 200 | | M1 | |
| | | | $5\times10^{198}$ | A1 | |
| | | | | | ***Total 4 marks*** |
| **18** | **(a)** | $12w^9y^0$ | | M1 | Two of the three parts correct |
| | | | $12w^9$ | A1 | |
| | **(b)** | 125 or $x^6$ | | M1 | |
| | | | $125\,x^6$ | A1 | |
| | | | | | ***Total 4 marks*** |
| **19** | | $\dfrac{FE}{3} = \dfrac{FC}{AC}$ , $\dfrac{FE}{7} = \dfrac{AF}{AC}$ | | M1<br>M1 | |
| | | $FC = \dfrac{7}{3}AF$ | | | |
| | | $AC = AF + "\dfrac{7}{3}AF"\left[= \dfrac{10}{3}AF\right]$ | | M1 | Using $AC = AF + FC$ |
| | | $FE = 3\times\dfrac{7/3\,AF}{10/3\,AF}$ | | M1 | |
| | | | 2.1 | A1 | Or equivalent |
| | | | | | ***Total 5 marks*** |

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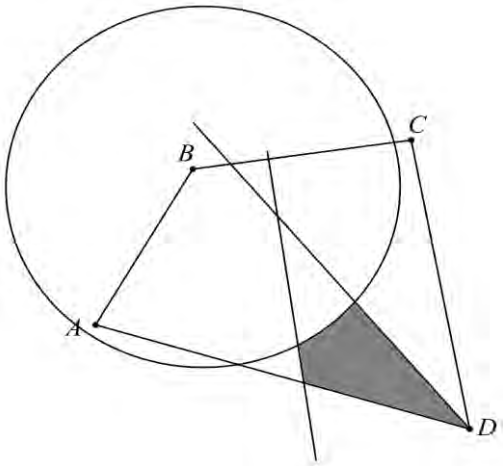
| **ALT** | | $\frac{FE}{3}=\frac{FC}{AC}$ , $\frac{FE}{7}=\frac{AF}{AC}$ | | M1<br>M1 | |
| | | $\frac{FE}{3}=\frac{AC-AF}{AC}=1-\frac{AF}{AC}$<br>or $\frac{FE}{7}=\frac{AC-FC}{AC}=1-\frac{FC}{AC}$ | | M1 | Using $AC = AF + FC$ |
| | | $\frac{FE}{3}=1-\frac{FE}{7}$ or $\frac{FE}{7}=1-\frac{FE}{3}$<br>or $FE\left(\frac{1}{3}+\frac{1}{7}\right)=1$ | | M1 | |
| | | | 2.1 | A1 | |
| **20** | |  | | | M1 For either an arc of a circle with centre *B*, or the angle bisector of *D* or a line parallel to *CD* (some part of these constructions must be 'inside' the given bounds of the overlay)<br><br>For the following three A marks the lines/arc must be of sufficient length to define the correct region<br><br>A1 for circle centre *B*, A1 for the angle bisector of *D* and A1 for the line parallel to *CD*<br><br>A1 All construction lines correct and region correctly labelled (construction arcs for angle bisector of *D* must be evident) |
| | | | | | ***Total 5 marks*** |

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| **21** | | $180-\frac{360}{11}\left[=147.27...\right]$ or $\frac{9\times180}{11}$ | | M1 | |
| | | $5\times180\left[=900\right]$ | | M1 | Could be seen in working |
| | | "900"$-5\times$"147.2..."$\left[=163.6...\text{ or }\frac{1800}{11}\right]$ | | M1dep | Oe e.g. $2x+5\times147.2=900$ - this mark is dependent on both previous M marks |
| | | $x=\frac{163.6}{2}$ | | M1dep | Dependent on all previous M marks |
| | | | 81.8 | A1 | Accept exact $\left(\frac{900}{11}\right)$ or awrt to 81.8 (81.81818…)<br>Oe e.g. $\frac{180-\left(\frac{360}{11}\right)\times\frac{1}{2}}{2}$ |
| | | | | | ***Total 5 marks*** |
| **22** | **(a)** | $\frac{(360-76)}{360}\times\pi\times16$ or<br>$16\pi-\frac{76}{360}\times\pi\times16$ | | M1 | |
| | | | 39.7 | A1 | Awrt to 39.7 or 39.6 (For reference: 39.65388… or $\frac{568}{45}\pi$) |
| | **(b)** | $\frac{360-76}{360}\times2\times\pi\times4$ [ = 19.8…] | | M1 | Or equivalent, e.g. $2\pi(4)-\frac{76}{360}\times2\pi(4)$ (For reference if correct: 19.82694… or $\frac{284}{45}\pi$ ) |
| | | 19.8… + 4 + 4 | | M1dep | |
| | | | 27.8 | A1 | Awrt to 27.8 (For reference: 27.826940…) |
| | | | | | ***Total 5 marks*** |

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| **23** | | $y = k_1 x^3$ | | M1 | |
| | | $x = \dfrac{k_2}{\sqrt{w}}$ | | M1 | Condone if the same letter is used for the two constants of proportionality |
| | | $729 = k_1 \times 4.5^3$ or $25 = \dfrac{k_2}{\sqrt{0.16}}$ | | M1dep | Dependent on one of the previous M marks – both equations imply the previous two marks |
| | | $y = 8x^3$ and $x = \dfrac{10}{\sqrt{w}}$ | | A1 | Or equivalent |
| | | | $y = 8000w^{-\frac{3}{2}}$ | A1 | Or equivalent e.g. $y = 8\left(\dfrac{10}{w^{\frac{1}{2}}}\right)^3$ |
| | | | | | ***Total 5 marks*** |
| **24** | | $\dfrac{10x-10}{2x+1} = \dfrac{35x-5}{10x-10}$ or $\dfrac{10x-10}{2x+1} = \dfrac{7x-1}{2x-2}$ | | M1 | Forming a correct equation any form |
| | | $100x^2 - 200x + 100 = 70x^2 + 25x - 5$ or $20x^2 - 40x + 20 = 14x^2 + 5x - 1$ | | M1dep | Removing the fractions and one side multiplied out correctly |
| | | $30x^2 - 225x + 105 = 0$ or $6x^2 - 45x + 21 = 0$ or $2x^2 - 15x + 7 = 0$ | | A1 | A correct three term quadratic in $x$ (any equivalent form) = 0 |
| | | $= (2x-1)(x-7)$ | | M1 | Correct method for solving their three-term quadratic in $x$, implied by $x = \dfrac{1}{2}$ or 7<br>Dependent on both previous M marks |
| | | | 4 | A1 | Only (A0 if given as the answer $-2.5$ too) |
| | | | | | ***Total 5 marks*** |

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| **25** | | $\overrightarrow{AC} = \begin{pmatrix} 3+x \\ -2+5x \end{pmatrix}$ | | B1 | |
| | | $(3+x)^2 + (-2+5x)^2 = 25$ | | M1 | Correct method for finding the modulus of $\overrightarrow{AC}$ (must contain $x$) and = 5 to form an equation – not from $\overrightarrow{AC} = \begin{pmatrix} 3x \\ -7x \end{pmatrix}$ |
| | | $13x^2 - 7x - 6 = 0$ | | M1dep | For correct method for multiplying out the brackets and simplifying to make a quadratic equation = 0 |
| | | $(x-1)(13x+6) = 0$<br>$\Rightarrow \overrightarrow{AC} = \begin{pmatrix} 3+'1' \\ -2+5('1') \end{pmatrix}$ | | M1 | Correct method for solving 3-term quadratic and substituting their positive value of $x$ into $\overrightarrow{AC}$ |
| | | | $\overrightarrow{AC} = \begin{pmatrix} 4 \\ 3 \end{pmatrix}$ | A1 | Answer with no working gains no marks |
| | | | | | ***Total 5 marks*** |

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| **26** | **(a)** | | $v = k - 10t$ | B1 | Allow mark if seen in part **(b)** – give bod if just right-hand side stated |
| | **(b)** | "$k - 10t$" $= 0$ leading to $t =$ "$\frac{k}{10}$" or $k =$ '$10t$'' | | M1 | Calculating the time from projection to maximum height (or equivalent) from their **(a)** |
| | | Maximum height reached by the ball is $(h-1)+h = 161 \Rightarrow h = 81$ | | B1 | Correctly deriving the maximum height reached by the ball (possibly implied in later working) |
| | | $f(k) = 1 + \frac{k^2}{10} - \frac{5k^2}{100}$ or $f(t) = 1 + 10t^2 - 5t^2$ | | M1 | Eliminating either $k$ or $t$ using their $k = 10t$ to obtain an expression in a single variable only (bod if the +1 is absent) |
| | | $81 = 1 + \frac{k^2}{10} - \frac{5k^2}{100}$ or $81 = 1 + 10t^2 - 5t^2$ | | M1dep | Setting up a correct equation in terms of $k$ or $t$ only with their $k = 10t$ (dependent on both previous M marks and B mark) |
| | | | 40 | A1 | A0 if final answer is $\pm 40$<br><br>Note that $1 + k\left(\frac{k}{10}\right) - 5\left(\frac{k}{10}\right)^2$ equal to either 161, 160, 80.5 or 80 (or equivalent) will score M1B0M1M0A0 or possibly M1B1M1M0A0 (if max. height found but subsequently not used) |
| | | | | | ***Total 6 marks*** |