Mark Scheme (Results)

January 2023

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

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January 2023
Publications Code P72478A

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, mark the method that leads to the answer on the answer line; where no answer is given on the answer line, award the lowest mark from the methods shown.

  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		[1 ×] 24 × 60 × 60 (=86400)		2	M1 or a 'correct' but unsimplified fraction eg $\frac{24}{43200}$ or this could be written as products eg $\frac{24\times 2}{24\times 60\times 60}$
			$\frac{1}{1800}$		A1 Accept exact equivalents eg $5.\dot{5}\times 10^{-4}$ ISW If correct fraction is seen then given as a decimal or in standard form.
		Correct answers scores full marks (unless from obviously incorrect working)			**Total 2 marks**

2		1, 2, 4, 6, 11, 13, 14, 20, 20		2	M1 for ordered list. Allow the first 5 terms or last 5 terms correct or a list with only one error (either one value omitted, one value added or one value either incorrect or incorrectly placed)
			11		A1
		Correct answers scores full marks (unless from obviously incorrect working)			**Total 2 marks**

3			$4n + 3$	2	B2 for $4n + 3$ oe eg $7+ 4(n – 1)$ (B1 for $4n + c$ where $c \neq 3$ or $xn + 3$ where $x \neq 4$)
		Correct answers scores full marks (unless from obviously incorrect working)			**Total 2 marks**

4			$25a^6$	2	B2 (B1 for a product with 1 part correct and 2 parts in total)
		Correct answers scores full marks (unless from obviously incorrect working)			**Total 2 marks**

5			$42x+\frac{8}{x^2}$	2	B2 oe eg $42x+8x^{-2}$ (B1 for one term correct need not be simplified)
		Correct answers scores full marks (unless from obviously incorrect working)			**Total 2 marks**

6			$2^4\times3^4\times5^4\times7\times11$	2	B2 oe (allow 62 370 000) isw if correct prime factors given (B1 for 4 455 000 or $2^3\times3^4\times5^4\times11$ or $2^m\times3^n\times5^p\times7\times11$ with 2 of *m*, *n* or *p* correct)
		Correct answers scores full marks (unless from obviously incorrect working)			**Total 2 marks**

7		$\frac{11}{3}+\frac{14}{5}$ or $\left[\frac{2}{3}+\frac{4}{5}=\right]\frac{10}{15}+\frac{12}{15}$		3	M1 for writing the fractions as improper fractions or for writing the fraction part of the values over a common denominator
		$\frac{11}{3}+\frac{14}{5}=\frac{55}{15}+\frac{42}{15}=\frac{97}{15}$ or $\left[3+2+\right]\frac{10}{15}+\frac{12}{15}=5\frac{22}{15}$ or $5+1\left[+\right]\frac{7}{15}$			M1 for writing improper fractions over a common denominator and showing they equal a correct improper fraction or for adding the whole number parts and the fraction parts over a common denominator. Accept sum with shared denominator eg. $\frac{5\times11+3\times14}{15}$
		eg $\frac{97}{15}=6\frac{7}{15}$ or $5\frac{22}{15}=6\frac{7}{15}$ or $5+1\left[+\right]\frac{7}{15}=6\frac{7}{15}$	Correctly showing completion to $6\frac{7}{15}$		A1 for completion to the correct answer with full working shown.
		Working required			**Total 3 marks**

8		14: 21 and 21 : 33 oe or 14 : 21 : 33 oe or $\left[\text{number of pigs}\right]=42\times\frac{3}{2}\left[=63\right]$		3	M1 for writing the ratios with a common figure for pigs or for writing a correct 3 part ratio or for finding the number of pigs Allow equivalent ratios eg 42:63 and 63: 99 or 42:63:99
		$42\times\frac{33}{14}$ oe or $"63"\times\frac{11}{7}$ oe or $204\times\frac{33}{14+21+33}$ oe or $204-42-"63"$			M1 for a fully correct method to find the number of sheep
			99		A1
		Correct answers scores full marks (unless from obviously incorrect working)			**Total 3 marks**

9		$3x^2-12x-63=0$ or $x^2-4x-21=0$ or $(2-x)^2=\frac{75}{3}[=25]$ oe		3	M1 For expanding and simplifying or for rearranging correctly to get an equation in standard quadratic form or as bracket squared = numerical expression – allow one sign or arithmetic error
		eg $(3x-21)(x+3)$ or $(x-7)(3x+9)$ or [3] $(x-7)(x+3)$ or $2-x=\pm\sqrt{"25"}$ or $2-x=\pm5$ or $x=2\pm\sqrt{"25"}$ or $x=2\pm5$ oe or $\frac{-(-12)\pm\sqrt{([-]12)^2-4\times3\times(-63)}}{2\times3}$ oe			M1 For correct method to solve their quadratic equation If factorising, allow brackets which when expanded give 2 out of 3 terms correct If using formula or completing the square allow one sign error
			7 and –3		A1 dep on M2
		Working required			**Total 3 marks**

10		$\frac{105+160-24}{60}$ oe or $\left[\frac{7}{4}+\frac{8}{3}\right]=\frac{53}{12}$ or $\left[\frac{8}{3}-\frac{2}{5}\right]=\frac{34}{15}$ or $\left[\frac{7}{4}-\frac{2}{5}\right]=\frac{27}{20}$ oe		3	M1 for method to write all fractions as equivalent fractions over a correct common denominator with at least 2 correct (may be seen as a single fraction or as separate fractions with a common denominator or for two fractions correctly combined In all cases just consider numerical values condone any or missing powers of x in numerator or denominator.
		$\frac{241}{60}$ oe			M1 dep on previous method mark Dealing with the numerical expression correctly to gain $\frac{241}{60}$ oe Condone any or missing powers of x in numerator or denominator.
			$\frac{241}{60x}$		A1 correct answer with no incorrect working gains full marks accept $\frac{241}{60}x^{-1}$ or $241(60x)^{-1}$ do not accept nested fractions Do not isw
		Correct answers scores full marks (unless from obviously incorrect working)			**Total 3 marks**

11		21.65 or 21.75 or 11.5 or 12.5 or 15 or 25		3	B1 at least for one correct bound seen
		$\frac{LB_w - UB_x}{UB_y}\left(=\frac{21.65-12.5}{25}\right)$			M1 where $21.65 \le LB_w < 21.7, \quad 12 < UB_x \le 12.5, \quad 20 < UB_y \le 25$
			0.366		A1oe $\frac{183}{500}$ allow awrt 0.366 Must be from correct working allow use of 12.499… and/or 24.99…
		Working required			**Total 3 marks**

12		$M = \frac{k}{p^3}$		3	M1 oe eg $Mp^3 = k$
		$0.8 = \frac{k}{25^3}$ oe or $k = 0.8 \times 25^3$ [= 12 500]			M1 dep Use given values to form an equation in k only This also implies the first M1
			$M = \frac{12500}{p^3}$		A1 oe (must include $M =$ for this mark, allow $\frac{12500}{p^3}$ only on answer line as long as $M = \frac{12500}{p^3}$ is seen in working)
		Correct answers scores full marks (unless from obviously incorrect working)			**Total 3 marks**

13		$28\times\frac{x+3}{7}+28\times\frac{2x-1}{4}=28\times5$ or $4(x+3)+7(2x-1)=28\times5$ or $\frac{4(x+3)}{28}+\frac{7(2x-1)}{28}[=5]$ or $\frac{4(x+3)+7(2x-1)}{28}[=5]$ or $\frac{x}{7}+\frac{x}{2}=5-\frac{3}{7}+\frac{1}{4}$		3	M1 for clear intention to multiply all terms by 28 (or 7 × 4) or a multiple of 28 or express LHS as two fractions over 28 (or 7 × 4) or a multiple of 28 if expanded numerator allow one sign or numerical error or express as a single fraction with a denominator of 28 (or 7 × 4) or a multiple of 28 if expanded numerator allow one sign or numerical error or separate out terms in x on one side of the equation allow one sign error
		$4x+12+14x-7=28\times5$ oe or $18x+5=140$ oe or $\frac{9x}{14}=\frac{135}{28}$ oe			M1 expanding brackets and multiplying by denominator with no more than one sign error or achieve an equation of the form $ax = b$ where a and b are rational. This mark implies the previous M mark if not already awarded.
			7.5		A1oe must have gained the previous M mark.
		Working required			**Total 3 marks**

14		$[r =]\frac{15-5-5}{2}[=2.5]$ oe		4	M1 could be seen in a calculation
		$\pi \times 2.5^2\left[=\frac{25}{4}\pi = 19.63...\right]$ or $\frac{1}{2}\times\pi\times 2.5^2\left[=\frac{25}{8}\pi = 9.817...\right]$ or $15\times 15[=225]$			M1 condone $\pi \times 5^2[=25\pi = 78.54...]$ or $\frac{1}{2}\times\pi\times 5^2\left[=\frac{25}{2}\pi = 39.27...\right]$
		$15\times 15 - \pi \times 2.5^2$ oe			M1 condone $15\times 15 - \pi \times 5^2[=146.46]$
			205		A1 awrt 205
		Correct answers scores full marks (unless from obviously incorrect working)			**Total 4 marks**

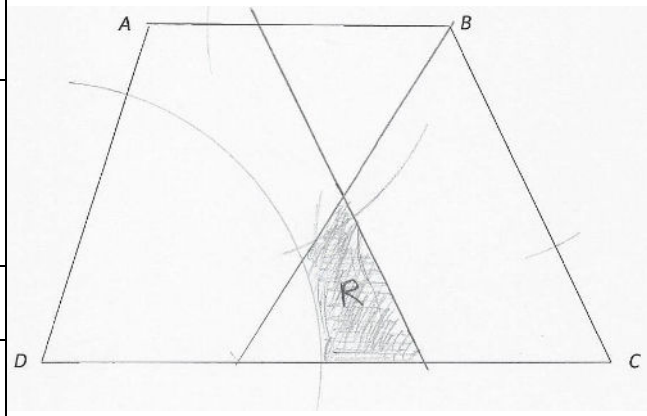
15		eg $45x + 35y = 15 -$ or $36x + 28y = 12 +$ $45x - 36y = 57.6$ $35x - 28y = 44.8$ $71y = -42.6$ $71x = 56.8$ or $5\left(\frac{3-7y}{9}\right) - 4y = 6.4$ or $5x - 4\left(\frac{3-9x}{7}\right) = 6.4$ or $9\left(\frac{6.4+4y}{5}\right) + 7y = 3$ or $9x + 7\left(\frac{5x-6.4}{4}\right) = 3$		4	M1 Correct method to eliminate x or y: coefficients of x or y the same **and** correct operation to eliminate selected variable (condone any one arithmetic error) **or** writing x or y in terms of the other variable and correctly substituting must gain an equation in one variable
			$x = 0.8$ or $y = -0.6$		A1oe one correct value dep on M1
		$9x + 7 \times "(-0.6)" = 3$ or $9 \times "0.8" + 7y = 3$ or $5x - 4 \times "(-0.6)" = 6.4$ or $5 \times "0.8" - 4y = 6.4$ oe			M1 (dep) correct method to find second variable – could start process again or use substitution dep on M1
			$x = 0.8$ and $y = -0.6$		A1oe for both correct values dep on both M marks
		Working required			**Total 4 marks**

16		$\tan 68 = \frac{AD}{20-16}$		4	M1 correct expression containing AD, may be labelled as h or x etc…
		$AD = \tan 68 \times 4$ [= 9.9…]			M1 Correct method to find AD
		$\left(\frac{16+20}{2}\right) \times "9.9"$ or $16 \times$ "9.9" + $0.5 \times (20 - 16) \times$ "9.9" or $20 \times$ "9.9" – $0.5 \times (20 - 16) \times$ "9.9" oe			M1 Correct method to find area, ft their AD
			178		A1 awrt 178
		Correct answers scores full marks (unless from obviously incorrect working)			**Total 4 marks**

17	(a)		23	1	B1
	(b)		10	1	B1
	(c)		22	1	B1
	(d)		19	1	B1
					SC award B1B1B0B0 for answers of (a) 6, (b) 2, (c) 4, (d) 3 SC award B1B0B0B0 for three of (a) 6, (b) 2, (c) 4, (d) 3
					Total 4 marks

18		$a^2 = \frac{3b+5}{b-d}$ or $a\sqrt{b-d} = \sqrt{3b+5}$		4	M1 for either squaring both sides to remove the square root or removing the denominator of the expression
		$a^2b - a^2d = 3b + 5$			M1 dep for squaring both sides to remove the square root and removing the denominator of the expression and expanding
		$a^2b - 3b = 5 + a^2d$ or $-a^2d - 5 = 3b - a^2b$			M1 for gathering terms in b on one side, and other terms the other side of a correct equation allow one sign error
			$b = \frac{5+a^2d}{a^2-3}$		A1 oe eg $b = \frac{-a^2d-5}{3-a^2}$ or $b = \frac{5+a^2d}{\left(a+\sqrt{3}\right)\left(a-\sqrt{3}\right)}$ (NB: if the final answer is missing b =…but is otherwise correct , award full marks if b = a correct expression has been seen in the working otherwise do not ISW)
		Correct answers scores full marks (unless from obviously incorrect working)			**Total 4 marks**

19		$DAB = 180 - 106$ [=74] or $ADC = 106$ or $EDF = 106$ or EDA or $FDC = 180 - 106$ [=74]		5	M1 award for angles marked on the diagram. Angle labels must be unambiguous (eg do not condone $A = 74$)
		$DEF + EFD = 180 - 106$ [=74] or $DEF = \frac{180-106}{2}$ or $DEF = \frac{"74"}{2}$ oe			M1 Condone $E + F = 180 - 106$ [=74]
			37		A1 Correct answer without full working gains the method marks but prevents the gaining of the following B marks.
			co-interior / allied angles add up to 180 or corresponding angles are equal or alternate angles are equal **And** Base angles in an isosceles triangle are equal		B2 for two correct reasons for their method used one relating to parallel line and one to isosceles triangle dep on M2 gained independent of A1 The reason must include at least the underlined words or an unambiguous abbreviation. Eg. Alt $\angle$ are equal is acceptable but Interior angles add up to 180 is not acceptable as interior angles usually refers to polygons Any incorrect reasons given award only B1 (B1 for one correct reason dep on M1 gained independent of A1)
		Correct answers scores at least M1M1A1 (unless from obviously incorrect working) *For B2 Working required*			**Total 5 marks**

20	(a)		Correct arc	1	B1 for an arc of a circle inside the trapezium that is 5 cm from *D* Must at least reach *AD* and *CD*, condone a full circle
	(b)		Correct bisector	2	B2 for a correct bisector of angle *ABC* with all construction arcs shown Must at least reach *CD* (B1 for a correct bisector with no construction arcs or for the construction arcs shown with no bisector drawn)
	(c)		Correct line	1	B1 for a line inside the trapezium that is 3 cm from *BC* Must at least reach *AB* and *CD*
	(d)		Correct region shown	1	B1 for correct region shown ft their diagram given At least B1 awarded for drawing a bisector in part (b) awarded, There must be an arc drawn with a centre of *D* There must be a line drawn parallel to *BC* The area indicated must be enclosed by these 3 edges and *CD*
					Total 5 marks

21	(a)	$6\times(\pm2)^3+31\times(\pm2)^2\pm2\times53+30=...$ **or** $6\times(\pm2)^3+31\times(\pm2)^2\pm2k+30=0$		2	M1 substitution of $x = \pm 2$ and $k = 53$ into expression and attempt to evaluate or substitution of $x = \pm 2$ into expression and equating to 0 to form an equation in k For both method allow with terms evaluated eg: $\pm48+124\pm106+30=...$
			$k = 53$		A1 Showing expression with $x = –2$ and $k = 53$ leads to 0 and a conclusion or Solving correct equation to gain $k = 53$ with no errors seen
	(b)	$(6x^2.....)$		3	M1 for a start to find the quadratic factor (allow $(2x + a)(3x + b)$)
		$(6x^2+19x+15)$			A1 for a fully correct quadratic factor (allow $(2x + 3)(3x + 5)$)
			$(x + 2)(2x + 3)(3x + 5)$		A1 fully correct allow NB: $(x+2)\left(x+\frac{3}{2}\right)\left(x+\frac{5}{3}\right)$ gains no marks Do not isw answer if roots are found this is A0
		(a) Working required *(b) Correct answers scores full marks (unless from obviously incorrect working)*			**Total 5 marks**

22	(a)		$\begin{pmatrix} 16 & 10 \\ 0 & -10 \end{pmatrix}$	2	B2 for all correct values B1 2×2 matrix with at least 2 correct values
	(b)	$\begin{pmatrix} -14+6 & -2x+12 \\ 28-2 & 4x-4 \end{pmatrix}$ oe or $(2 - 12)(28 - 2x) = 20$		4	M2 all correct in matrix **BC**, M1 for 2 or 3 elements correct give bod for missing brackets or M2 for $(2 - 12)(28 - 2x) = 20$ (M1 for this equation with one error)
		$-8(4x-4)-26(12-2x)=20$ or $-32x+32-312+52x=20$ or $20x=300$ oe or $28 - 2x = 20 \div (-10)$ or $-280 + 20x = 20$ or $20x = 300$ oe			M1 for an equation for the determinant ft their matrix dep on M1 previously scored or M1 for correctly removing brackets from their "$(2 - 12)(28 - 2x) = 20$" dep on M1 previously scored
			15		A1
		Correct answers scores full marks (unless from obviously incorrect working)			**Total 6 marks**

23	(a)		7	1	B1
	(b)	$15^{2x} = (3\times5)^{2x}$ or $3^{2x}\times5^{2x}$ $10^{2x} = (2\times5)^{2x}$ or $2^{2x}\times5^{2x}$ $4^{x-1} = \left(2^2\right)^{x-1}$ or 2^{2x-2} or $2^{2x}\times2^{-2}$ or $\frac{2^x}{2^2}$ $81^3 = \left(3^4\right)^3$ or 3^{12}		5	M2 for 3 or 4 of these – or cancelling out 2 or 3 of 2^2 with 4^{-1} 5^{2x} on numerator with 5^{2x} on denominator 4^x on the numerator with 2^{2x} on denominator (M1 for 2 of the items on the LHS or cancelling out 1 of the above)
		$3^{2x}\times3^{5x^2-15x}\times3^{x+3} = 3^{12}$ or $3^{2x+5x^2-15x+x+3} = 3^{12}$			M1 equation with terms not as 3 to a power cancelled with no more than one error or one term not as 3 to a power (must be 9 or 81 to a power)
		$5x^2 - 12x - 9 (= 0)$ oe			A1 correct quadratic
			–0.6, 3		A1 oe cao
		Correct answers scores full marks (unless from obviously incorrect working)			**Total 6 marks**

24		eg $h = \dfrac{3\times1000}{10\times10}$ [= 30]		5	M1 for a correct calculation for the height of the pyramid or the correct height
		$[CX =]\sqrt{10^2+5^2}\ (=\sqrt{125}=5\sqrt{5}=11.18...)$ or $[EX =]\sqrt{"30"^2+5^2}\ (=\sqrt{925}=5\sqrt{37}=30.41...)$ or $[CM =]\dfrac{1}{2}\sqrt{10^2+10^2}\ (=\sqrt{50}=5\sqrt{2}=7.07...)$ (where *M* is midpoint of base)			M1 for a fully correct calculation for *CX*, *EX* or *CM* that would leads to a value correct to 3 significant figures follow through their *h*
		For 2 of: $[CX =]\sqrt{10^2+5^2}\ (=\sqrt{125}=5\sqrt{5}=11.18...)$ or $[EX =]\sqrt{"30"^2+5^2}\ (=\sqrt{925}=5\sqrt{37}=30.41...)$ or $[CE =]\sqrt{"30"^2+("5\sqrt{2}")^2}\ (=\sqrt{950}=5\sqrt{38}=30.82...)$			M1 for a correct calculation of 2 from *CX*, *EX* and *CE* that would leads to a value correct to 3 significant figures follow through their *h* and *CM*
		$\cos^{-1}\left(\dfrac{("5\sqrt{38}")^2+("5\sqrt{37}")^2-("5\sqrt{5}")^2}{2\times"5\sqrt{38}"\times"5\sqrt{37}"}\right)$			M1 dep on all previous M marks correct method to find $\angle CEX$ that would lead to a correct value follow through their *CE*, *EX* and *CX*
			21		A1 awrt 21
		Correct answers scores full marks (unless from obviously incorrect working)			**Total 5 marks**

25	(a)	$\overrightarrow{OB} = \mathbf{c} + 3\mathbf{a}$ or $\overrightarrow{BO} = -3\mathbf{a} - \mathbf{c}$		3	M1
		$OM' = \frac{7}{10}"(\mathbf{c} + 3\mathbf{a})"$ or $BM' = \frac{3}{10}"(-3\mathbf{a} - \mathbf{c})"$			M1 ft their $\overrightarrow{OB}$ or $\overrightarrow{BO}$, must be a vector in terms of **a** and **c**
			$\frac{21}{10}\mathbf{a} - \frac{3}{10}\mathbf{c}$		A1 oe but must be simplified (eg $\frac{3}{10}(7\mathbf{a} - \mathbf{c})$)

	(b)	$\overrightarrow{AP} = \lambda(2\mathbf{a}+\mathbf{c})$ and $\overrightarrow{AP} = -\mathbf{a}+\mathbf{c}+\mu"\left(\frac{21}{10}\mathbf{a}-\frac{3}{10}\mathbf{c}\right)"$ or $\overrightarrow{BP} = \alpha(-2\mathbf{a}-\mathbf{c})$ and $\overrightarrow{BP} = -3\mathbf{a}+\beta"\left(\frac{21}{10}\mathbf{a}-\frac{3}{10}\mathbf{c}\right)"$ or $\overrightarrow{OP} = \mathbf{a}+\gamma\left(2\mathbf{a}+\mathbf{c}\right)$ and $\overrightarrow{OP} = \mathbf{c}+\delta"\left(\frac{21}{10}\mathbf{a}-\frac{3}{10}\mathbf{c}\right)"$ or $\overrightarrow{CP} = \mathbf{a}-\mathbf{c}+\varepsilon(2\mathbf{a}+\mathbf{c})$ and $\overrightarrow{CP} = \zeta"\left(\frac{21}{10}\mathbf{a}-\frac{3}{10}\mathbf{c}\right)"$ or $\dot{MP} = \frac{9}{10}\mathbf{a}+\frac{3}{10}\mathbf{c}+\eta(-2\mathbf{a}-\mathbf{c})$ and $\overrightarrow{MP} = \theta"\left(\frac{21}{10}\mathbf{a}-\frac{3}{10}\mathbf{c}\right)"$		4	M2 for 2 correct expressions for $\overrightarrow{AP}$, $\overrightarrow{BP}$, $\overrightarrow{OP}$, $\overrightarrow{CP}$ or $\overrightarrow{MP}$ with different scalar variables. One should use $\overrightarrow{AB}$ and one $\overrightarrow{CM}$ oe Follow through their $\overrightarrow{CM}$ allow any multiple of $\overrightarrow{CM}$ (eg $7\mathbf{a} - \mathbf{c}$) Treat any of $\frac{x}{x+y}$, $\frac{y}{x+y}$, $\frac{\lambda}{1+\lambda}$ or $(1+\mu)$ oe. as single scalar variables Allow for two vector expressions equated in which case allow for example $\overrightarrow{AB} = \lambda\overrightarrow{AP}$ given in terms of **a** and **c** (M1 for one correct expression for $\overrightarrow{AP}$, $\overrightarrow{BP}$, $\overrightarrow{OP}$, $\overrightarrow{CP}$ or $\overrightarrow{MP}$)
		2 equations from comparing coefficients $2\lambda = -1+\frac{21}{10}\mu$ and $\lambda = 1-\frac{3}{10}\mu$ or $-2\alpha = -3+\frac{21}{10}\beta$ and $-\alpha = -\frac{3}{10}\beta$ or $1+2\gamma = \frac{21}{10}\delta$ and $\gamma = 1-\frac{3}{10}\delta$ or $1+2\varepsilon = \frac{21}{10}\zeta$ and $-1+\varepsilon = -\frac{3}{10}\zeta$ $\frac{9}{10}-2\eta = \frac{21}{10}\theta$ and $\frac{3}{10}-\eta = -\frac{3}{10}\theta$			M1 dependant on 2 expressions for $\overrightarrow{AP}$ $\overrightarrow{BP}$, $\overrightarrow{OP}$, $\overrightarrow{CP}$ or $\overrightarrow{MP}$ with 2 variable scalar coefficients Correct values from these equations: $\lambda = \frac{2}{3}, \mu = \frac{10}{9},\ \alpha = \frac{1}{3}, \beta = \frac{10}{9},\ \gamma = \frac{2}{3}, \delta = \frac{10}{9},$ $\varepsilon = \frac{2}{3}, \zeta = \frac{10}{9},\ \eta = \frac{1}{3}, \theta = \frac{1}{9}$
			2 : 1		A1 dep on all method marks gained
		(a) Correct answers scores full marks (unless from obviously incorrect working) *(b) Working required*			**Total 7 marks**

26	(a)	$2.5\times10+10\times7+20\times5+27.5\times6+35\times12$ $\left[=25+70+100+165+420=780\right]$		4	M2 for correct calculation (need not be evaluated) If no working shown then figures must be correct Give bod if values in a list and a total given. M1 *xf* calculated and added for at least 3 class intervals where *x* is a number in the range (including end points) or correct mid-points used for at least 3 products but not added
		"780" ÷ 40			M1 dep on M1
			19.5		A1
	(b)	For a correct frequency density on the FD axis – one 2cm square height = FD of 0.5 or height of 15 – 30 bar is 1.2 or 10 – 15 bar is 2.4, may be seen besides the table		4	M1 for use of area to work out frequency density, implied by any correct aspect of the table or graph seen
			12,18 and bars of height 0.4 between 0 and 10 and 0.2 between 30 and 60		A3 for all four correct A2 for three correct A1 for two correct The heights must be drawn on the histogram correct to 1 small square.
		Correct answers scores full marks (unless from obviously incorrect working)			**Total 8 marks**

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