Mark Scheme (Results)

Summer 2025

Pearson Edexcel International GCSE
In Mathematics B (4MB1) 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.
- 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 – can only be awarded when relevant M marks have been gained
  - B marks: unconditional accuracy marks (independent of M marks)

- **Abbreviations**
  - cao – correct answer only
  - cso – correct solution 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 may score full marks
  If no working is shown, then incorrect (even though nearly correct) answers score no marks.

- **With working**
  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: e.g. uses 252 instead of 255; follow through their working and deduct 2A marks from any gained provided the work has not been simplified. (Do not deduct any M marks gained.)

  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

  Examiners should send any instance of a suspected misread to review (but see above for simple misreads).

- **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: e.g. 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 e.g. algebra.

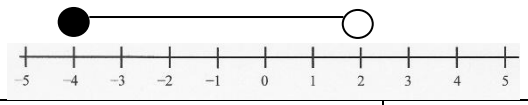
- **Parts of questions**
  Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded to another.

Question	Working	Answer	Mark	Notes
1		1.5707	2	B2 for 1.5707 (B1 for 1.57070(0000…) or 1.57073 or 1.57(...) seen anywhere in working or B1ft for correctly rounding any number, given first with at least 6 sf, to 5 sf) SC1 for $\frac{322}{205}$
	cas			***Total 2 marks***
2		5, −2, −9	2	B2 −1 for every error or omission Any order If answers correct in working and transcribed incorrectly to answer line, mark the correct work and isw. Also B2 if answers correct in working and not transcribed.
	cas			***Total 2 marks***
3	180(30 – 2) [= 5040] or $90(2\times30-4)$ [=5040] or 360/30 [= 12]		2	M1 for the method for calculating the sum of interior angles. May be seen or used in any working eg [180(30 – 2)/30] or 5040/30 or for calculating the exterior angle. May be seen or used in further working eg [180 – 360/30]
		168		A1
	cas			***Total 2 marks***

Question	Working	Answer	Mark	Notes
4	eg $\frac{17}{3}-\frac{14}{5}$ oe or $\left[\frac{2}{3}-\frac{4}{5}=\right]\frac{10}{15}-\frac{12}{15}$ oe		3	M1 for correctly writing the fractions as improper, allow if $\frac{17}{3}$ and $\frac{14}{5}$ oe seen in other working or for correctly writing the fraction part of the values over a common denominator. It is not necessary to see the – sign for this mark.
	eg $\left[\frac{17}{3}-\frac{14}{5}=\right]\frac{85}{15}-\frac{42}{15}$ oe or $\left[\frac{10}{15}-\frac{12}{15}=\right]=-\frac{2}{15}$ oe and $[5-2=]3$ or $4\frac{25}{15}-2\frac{12}{15}$			M1 dependent on previous method mark for correctly writing improper fractions over a common denominator. Accept sum with shared denominator or which shows working eg. $\frac{5\times17-3\times14}{15}$ or $\frac{5\times17}{3\times5}-\frac{3\times14}{5\times3}$ oe Do not accept eg $\frac{5}{3}\times5-\frac{3}{5}\times3$ unless recovered or correctly subtracting whole number parts and the fraction parts over a common denominator. It is not necessary to see the – sign for this mark.
		$\frac{43}{15}=2\frac{13}{15}$ or $3-\frac{2}{15}=2\frac{13}{15}$ or $4\frac{25}{15}-2\frac{12}{15}=2\frac{13}{15}$		A1 dependent on both previous method marks for completion to the correct answer with the minimum number of steps as shown, dependent on the candidate's approach. No errors or omissions. A – sign must be present at least once through their working to indicate subtraction.
	wr			***Total 3 marks***

Question		Working	Answer	Mark	Notes
5		eg $AC^2 + 20^2 = 42.5^2$ or $AC^2 + 400 = 1806.25$ or $[AC^2 =] 1806.25 - 400$ or $[AC=]\sqrt{42.5^2 - 20^2}$ $[AC^2 =] 42.5^2 - 20^2 \ (= 1406.25)$		2	M1 for applying Pythagoras theorem correctly. 1406.25 implies this mark. Be aware $42.5^2 = AC^2 + 20^2 - 2\times 20\times \cos 90$ is equivalent and M1 Allow any letters or labelling that implies a correct use of Pythagoras.
			37.5		A1
ALT		$\cos B = \frac{20}{42.5}$ or $[B =] \cos^{-1}\left(\frac{20}{42.5}\right) (= 61.9275...)$ **and** $\tan("61.9275...") = \frac{AC}{20}$ or $[AC =] \tan("61.9275...") \times 20$ or $\sin C = \frac{20}{42.5}$ or $[C =] \sin^{-1}\left(\frac{20}{42.5}\right) (= 28.0724...)$ **and** $\tan("28.0724...") = \frac{20}{AC}$ or $[AC =] \frac{\tan("28.0724.....")}{20}$		2	M1 for a full correct method using trigonometry. Allow any letters or labelling that implies a correct use of Trigonometry. oe method using non right-angled trig $\frac{20}{\sin C} = \frac{42.5}{\sin 90}$ oe eg or $[C =] \sin^{-1}\left(\frac{20}{42.5}\times \sin 90\right) (= 28.0724....)$ oe and $[AC =]$ $\sqrt{20^2 + 42.5^2 - 2\times 20\times 42.5\cos(180 - "28.0724" - 90)}$ oe
			37.5 oe eg 75/2		A1 This is an exact answer but allow awrt 75/2 or 37.5
		cas			***Total 2 marks***

Question		Working	Answer	Mark	Notes
6		$g+4e^2=5d$ or $\frac{g}{5}=d-\frac{4e^2}{5}$ or $\frac{g+4e^2}{5}$ or $-g-4e^2=-5d$ or $-\frac{g}{5}=-d+\frac{4e^2}{5}$ or $\frac{-g-4e^2}{-5}$		2	M1 for a correct first step eg by adding $4e^2$ or dividing throughout by 5 or correct expression for d without d = …
			$d=\frac{g+4e^2}{5}$ or $d=\frac{-g-4e^2}{-5}$		A1 oe eg $d=\frac{g}{5}+\frac{4e^2}{5}$ Allow the other way round eg $\frac{g+4e^2}{5}=d$ Must see d = … or … = d at least once but allow if correct answer is in final answer in working but omitted on the answer line. Do not ISW
		cas			***Total 2 marks***

Question		Working	Answer	Mark	Notes
7		closed circle at $x = -4$ **or** open circle at $x = 2$ **or** a single line joining $x = -4$ and $x = 2$		2	M1 (with single line closed, open, no circles or any other shape at $x = -4$ and $x = 2$). If clear and distinguishable, allow the line drawn to be on the printed number line.
					A1 **Both** end points identified using the correct symbols **and** one correct line drawn between the two correct points.
		cas			***Total 2 marks***

Question		Working	Answer	Mark	Notes
8	(a)		1	1	B1 cao $p = 1$ scores B0, no isw this answer
	(b)		$8q^{12}r^3$	2	B2 Allow in any order eg $q^{12}r^3 8$ 8 must be not be 2^3 (B1 for a product with 2 parts correct and 3 parts in total) Condone inclusion of multiplication signs for B1.
		cas			***Total 3 marks***

Question		Working	Answer	Mark	Notes
9		27 : 6 and 6 : 10 oe or 27 : 6 : 10 oe or 360 : 600 or $[\text{train}] = 600 \times \frac{3}{5} [= 360]$ or $\frac{600 \times 8}{5} [= 960]$ [total students for 2nd ratio]		3	M1 for writing the ratios with a common figure or for writing a correct 3 part ratio or for number of students who travel by train or for total students for 2nd ratio. Allow equivalent ratios eg 54:12 and 12: 20 or 54:12:20 Allow any of the ratios or number to be implied eg [Bus =] 27, [train =] 6, [car =] 10 or 27, 6, 10 or $\frac{27}{6}$ and $\frac{6}{10}$ or $\frac{6}{27}$ and $\frac{10}{6}$ Ignore incorrect labelling. Can be implied by the next M Mark.
		$600 \times \frac{27}{10}$ oe or $"360" \times \frac{9}{2}$ oe or $[\text{total students}] = 600 \times \frac{27+6+10}{10} [= 2580]$ **and** $"2580" \times \frac{27}{27+6+10}$ or $"2580" - 600 - "360"$ oe or 960 – 600 [=360] and $\frac{360 \times 11}{2}$ [=1980] and 1980 – 360 = 1620			M1 for a full and correct method to find the number of students who catch the bus.
			1620		A1
		cas			***Total 3 marks***

Question		Working	Answer	Mark	Notes
10	(a)		$2^2 \times 3^x$	1	B1 do not isw Condone eg $2^2 3^x$ Allow 2×2 but not 4
	(b)		$2^4 \times 3^{2x+1} \times 7^{x+1}$	1	B1 condone eg $2^4 \times 3^{2x} \times 3^1 \times 7^x \times 7^1$ for B1 do not isw Condone $2^4 3^{2x+1} 7^{x+1}$ Allow $2 \times 2 \times 2 \times 2$ but not 16
	(c)		21	1	B1 cao
		cas			***Total 3 marks***

Question		Working	Answer	Mark	Notes
11		$\sqrt{225\times3} - \sqrt{36\times3}$ or $\sqrt{25\times27} - \sqrt{4\times27}$ or $15\sqrt{3} - 6\sqrt{3}$ or $5\sqrt{27} - 2\sqrt{27}$		3	M1 Must see 675 and 108 decomposed. The square roots don't need to be present if there is a correct decomposition Allow further decomposition for this mark (eg $225 = 5\times5^2\times3$ eg $108 = 4\times3^3$), so long as 675 and 108 are decomposed into at least the equivalent of 225 x 3 and 36 x 3 or 25 x 27 and 4 x 27 do not allow $9\sqrt{3}$ alone for M1 do not allow, for example $\sqrt{225\times3} - \sqrt{4\times27}$ only unless recovered later in the question. Not necessary to see subtraction sign for this mark.
		$9\sqrt{3}$ or $3\sqrt{27}$			M1 (dep on first M1) Not necessary to see subtraction sign for this mark, but must be a square root.
		Please send any alternative methods seen to review.	243		A1 (dep on both M marks) condone $\sqrt{243}$ Subtraction sign seen at least once. No incorrect working for the A mark.
		wr			***Total 3 marks***

Question		Working	Answer	Mark	Notes
12		$12\times\frac{2x+3}{4}+12\times\frac{x-1}{3}=12\times 7$ or $12\times\left(\frac{2x+3}{4}+\frac{x-1}{3}\right)=12\times 7$ oe or $3(2x+3)+4(x-1)=12\times 7$ or $\frac{3(2x+3)}{12}+\frac{4(x-1)}{12}\left[=7\right]$ or $\frac{3(2x+3)+4(x-1)}{12}\left[=7\right]$ or $\frac{2x}{4}+\frac{3}{4}+\frac{x}{3}-\frac{1}{3}=7$ oe		3	M1 for clear intention to multiply all terms by 12 (or 4 × 3) or a multiple of 12 Do not allow eg $12\times\frac{2x+3}{4}+\frac{x-1}{3}=12\times 7$ unless recovered or oe express LHS as two fractions over 12 (or 4 × 3) or a multiple of 12 or oe express as a single fraction with a denominator of 12 (or 4 × 3) or a multiple of 12 If numerator expanded allow 1 sign or numerical error or separate out terms on the left
		$6x+4x=12\times 7-9+4$ oe or $10x=79$ oe or $\frac{10x}{12}=\frac{79}{12}$ oe $\frac{6x}{12}+\frac{4x}{12}=7-\frac{3}{4}+\frac{1}{3}$ oe $\frac{6x+4x}{12}=\frac{79}{12}$ oe			M1 for a correct equation with no brackets and *x* terms gathered on one side, constants on the other – examples given, look for equivalences. This mark implies the previous M mark if not already awarded.
			7.9		A1oe must have gained the previous M mark.
		wr			***Total 3 marks***

Question		Working	Answer	Mark	Notes
13		$5\times EC=13\times 7(=91)$ or $\left[EC=\right]\frac{13\times 7}{5}(=18.2)$		3	M1 correct equation in *EC* or correct method to find *EC*
		$[r=]\frac{"18.2"+5}{2}$			M1 correct method to find the radius – general principle of marking unless precluded, allow follow through of their 18.2, where *EC* comes from correct working or is clearly labelled. ***EC* must not be 15.**
			11.6		A1
		cas			***Total 3 marks***

Question		Working	Answer	Mark	Notes
14				3	M1 for drawing a tangent to the curve at $t = 5$ Mark intention for a line which touches at $t = 5$ and isn't seen to cross the curve
					M1 dep on previous method mark, for complete method to find gradient of their tangent at t = 5 (change in *y* over change in *x*) **May be implied by a number in the range 24-36 inclusive, provided a tangent has been drawn and not from obvious incorrect working.** **Working may be seen on the diagram** If the answer is not in range, we must see a calculation for the gradient of the form $\frac{y_2-y_1}{x_2-x_1}$.
			30		A1 dep on first M1 answer range 24-36 inclusive. Must come from a gradient of a tangent and not gradient of a chord. Must see tangent drawn.
		wr			***Total 3 marks***

Question		Working	Answer	Mark	Notes
15		[Angle *ROT* =] 180 – 2 × 28 [= 124] or [Angle *TOS* =] 28 × 2 [= 56] or [Angle *OTS* =] 90 or [Angle *TRO* =] 28		4	M1 for method to find *TOR* or for method to find *TOS* or *OTS* = 90 or *TRO* = 28 **Mark angles seen on the diagram.**
		[Angle *OST* =] 180 – 90 – "56" or [Angle *OST* =] 180 – (28 + 90) – 28			M1 complete method to find *OST* using 90 degrees Allow 180 – 90 – their *TOS* or 180 – (28 + 90) – their *TRO* If it is clear they are using their *TOS* or their *TRO* May imply previous method mark.
		cas	34		A1 cao no isw for this question
					B1 (dep on M2) Angle between radius and tangent = 90 or perpendicular **and** one other reason stated that is **r.elevant for their method** Base angles in an isosceles triangle are equal or angles equal as 2 sides equal. Exterior angle of a triangle equal to sum of interior opposite angles Angles in triangle **or** angles in a triangle add to 180 Angles on a straight line **or** angles on a line add to 180 Angle at centre = Double angle at circumference Allow an angle symbol for the word angle.
					Total 4 marks

Question		Working	Answer	Mark	Notes
16	(a)		$5p^2q(2q^3-3p)$	2	B2 for $5p^2q(2q^3-3p)$ (B1 for correct partial factorisation seen on answer line or working space $5p^2(2q^4-3pq)$ or $p^2q(10q^3-15p)$ or $5q(2p^2q^3-3p^3)$ or $5p^2q(2q^3-3p)$ or $5pq(2pq^3-3p^2)$ or for correctly identifying the HCF in a factorisation of the form $5p^2q(aq^3\pm...)$ or $5p^2q(...\pm bp)$ where *a* and *b* are integers).
	(b)		$(2x+1)(x-5)$	2	B2 (B1 for any factorisation of the form $(ax+b)(x+c)$, where a,b and c are integers which expands to give 2 out of 3 correct terms B1 if further work shows a misunderstanding, such as solving)
		cas			***Total 4 marks***

Question		Working	Answer	Mark	Notes
17		(cube surrounding 1 cube around a sphere=) $8\times8\times8[=512]$ (whole cuboid=)$(8\times3)\times(8\times2)\times(8)[=3072]$ or		4	M1 for volume of cuboid NB: Students can find the volume of the cube around each ball and follow this through to get a correct answer
		(1 ball=)$\frac{4}{3}\pi\left(\frac{8}{2}\right)^3\left[=\frac{256\pi}{3}=268.0825731\right]$ or (*n* balls=)$n\times\frac{4}{3}\pi\left(\frac{8}{2}\right)^3$ $[=512\pi=1608.495439]$ for 6 balls			M1 for volume of 1 or *n* balls where *n* is an integer.
		eg $"3072-512\pi"$ oe eg $6\times\left("512-\frac{256\pi}{3}"\right)$ oe			M1 for a complete method to find the volume of the whole remaining space (dependent on both previous method marks, but implies previous 2 marks).
			1460		A1 awrt 1460 (1463.504561)
		cas			***Total 4 marks***

Question		Working	Answer	Mark	Notes
18	(a)	Fd = 3 or 2 or 1 oe seen by the table or in working or on the graph or a correct frequency indicated. Watch out for equivalences such as 180/60 [= 3] **or** for a correct frequency density on the FD axis where the height of one large square is 2 eg height of 0-30 bar is 9, **or** height of 30-60 bar is 7 **or** height of 60-120 bar is 3, (may be seen besides the table) **or** 1 small square = 1.2 oe **or** 1 medium square (5×5) = 30 oe **or** 1 large square (10×10) = 120 oe		3	M1 for use of area to work out frequency density, implied by a correct fd or a correct frequency per square(s) or a correct scale on the *y*-axis or a correct frequency or the 180-300 (height 1) or the 120-180 (height 2) bars completed at the correct height (even if fd not marked or incorrect). Allow multiples of squares eg 2 large squares = 240
			270 and 210 and height 2 (120-180) and height 1 (180-300)		A2 for all four correct (if not A2 then A1 for two or three correct)
	(b)		$\frac{4}{15}$	1	B1 oe eg $\frac{240}{900}$ or If writing a decimal 0.26^{r}, $0.2\dot{6}$, 0.26…(minimum one 6), 0.27. Do not accept 0.3.
		cas			***Total 4 marks***

Question		Working		Answer	Mark	Notes
19		eg $f = kg^2$ eg $f = \frac{g^2}{k}$	eg $g = \frac{K}{h}$ eg $g = \frac{1}{K} \times \frac{1}{h}$		4	M1 for setting up either equation with a constant term Equation can be implied by correct substitution. The constant term can be any other letter apart from *f* or *g* or *h* T783478he first 3 M marks can be awarded if using the same letter for the constant of proportionality in both equations. allow use of 'α' instead of '=', so long as there are constants of proportionality $\neq 1$ Note that $f = \text{or} \propto g^2$, $g = \text{or} \propto \frac{1}{h}$ are M0 May be implied by 2nd or 3rd M1
		$9 = k5^2$ **or** $5 = \frac{K}{4}$ $[9 = 25k]$ $[K = 4 \times 5 = 20]$ $\left[k = \frac{9}{25}\right]$				M1 for substitution of values into **either** equation Implied by the correct values of one of the constants of proportionality. allow use of 'α' instead of '=', so long as there are constants of proportionality $\neq 1$ May be implied by the 3rd M1.
		$9 = k5^2$ **and** $5 = \frac{K}{4}$ $[9 = 25k]$ $[K = 4 \times 5 = 20]$ $\left[k = \frac{9}{25}\right]$				M1 for substitution of values into **both** equations $9 = k5^2$ oe **and** $5 = \frac{K}{4}$ oe allow use of 'α' instead of '=', so long as there are constants of proportionality $\neq 1$ Implied by the correct values for both constants.
		$f = \frac{9}{25}g^2$	$g = \frac{20}{h}$	$f = \frac{9}{25}\left(\frac{20}{h}\right)^2$		A1 oe eg $f = \frac{144}{h^2}$ Must see *f* = at least once The question doesn't ask for simplification, Equivalents are fine. Once the correct unsimplified answer is seen, you may isw. Do not allow poor notation eg $f = \frac{9}{25} \times \frac{20^2}{h}$
		$f = \frac{9}{25}\left(\frac{20}{h}\right)^2$ $\left[f = \frac{9}{25}\left(\frac{400}{h^2}\right) = \left(\frac{3600}{25h^2}\right)\right]$				
						Total 4 marks

ALT	$f = \frac{k}{h^2}$			M1 for combining two equations allow use of 'α' instead of '=', so long as there is a constant of proportionality $\neq 1$ Note that $f =$ or $\propto \frac{1}{h^2}$ are M0 May be implied by 2nd or 3rd M mark
	$9 = \frac{k}{4^2}$			M1 for substitution of values May be implied by 3rd M mark
	$k = 144$			M1 for finding *k* by a correct rearrangement Implied by correct 144
		$f = \frac{144}{h^2}$		A1 oe eg $f = \frac{9 \times 4^2}{h^2}$ Must see $f =$ at least once The question doesn't ask for simplification, Equivalents are fine. Do not allow poor notation. Allow any value of *g*, due to the *g* cancelling.
	cas			***Total 4 marks***

Question		Working	Answer	Mark	Notes
20		$[m_{LB} =]2135,\ [m_{UB} =]2145$ $[d_{LB} =]0.65,\ [d_{UB} =]0.75$ $[r_{LB} =]8.25,\ [r_{UB} =]8.75$		4	B1 For one correct LB or UB seen or used. May be implied by subsequent working.
		[Volume =] $3.142\times(r)^2 h$ oe where $8.25\le r\le 8.75$ **or** [Volume =] $\frac{m}{d}$ oe where $2135\le m\le 2145$ and $0.65\le d\le 0.75$			M1 Correct method to find Volume. Allow π or $\frac{22}{7}$ or 3.14 or 3.1 or 3 instead of 3.142 You may see this as part of other (incorrect) work eg $\frac{\mathbf{2135}}{\mathbf{0.75}\times 2\times 3.142\times 8.75}$ the $\frac{2135}{0.75}$ is implicit
		$[h =]\frac{"2135"}{3.142\times"8.75"^2\times"0.75"}$ oe or $"0.75" = \frac{"2135"}{3.142\times"8.75"^2\times h}$ oe or $3.142\times"8.75"^2\times h = \frac{"2135"}{"0.75"}$ oe			M1 dep on previous M being awarded, but may imply previous M mark For a correct expression for the height of cylinder used or a correct formula used, must see $2135\le m_{LB}<2140,$ r_{UB} where $8.5<r_{UB}\le 8.75,$ and d_{UB} where $0.7<d_{UB}\le 0.75$ Allow if use π or $\frac{22}{7}$ or 3.14 or 3.1 or 3 instead of 3.142
			$\frac{2135}{3.142\times 8.75^2\times 0.75} = 11.8$		A1 awrt 11.8 from correct working. Must be seen to use 2135, 8.75 (Allow 8.7499…), 0.75 (Allow 0.7499…) but may be seen in stages.
		wr			***Total 4 marks***

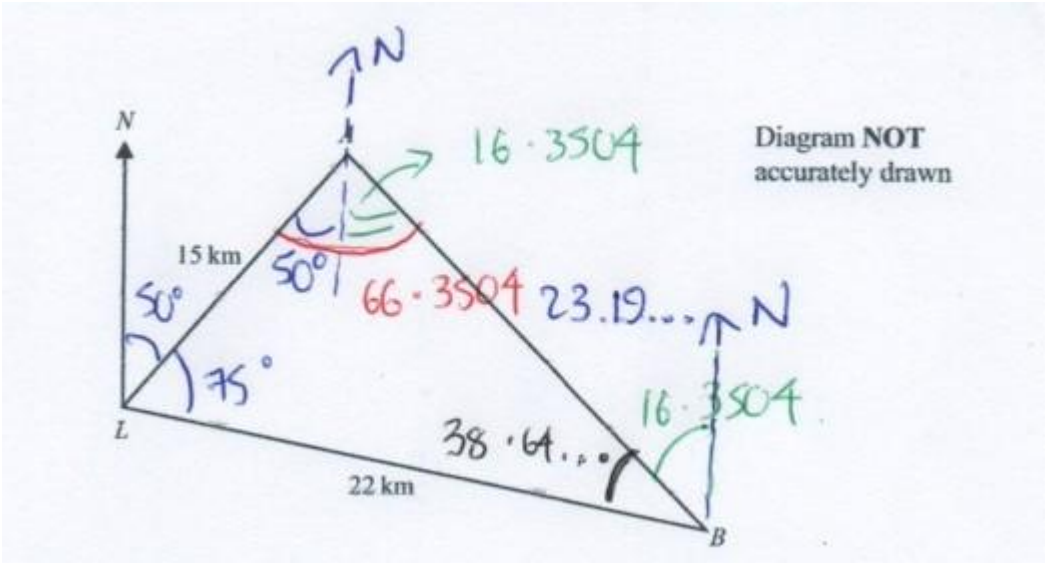
Question		Working	Answer	Mark	Notes
21	(a)		$\begin{pmatrix} 1 & -3-p \\ -5+2p & 6 \end{pmatrix}$	2	B2 correct (B1 for 3 correct values or expressions in the correct position)
	(b)		$\frac{1}{5}\begin{pmatrix} 10 & 3 \\ 5 & 2 \end{pmatrix}$ oe eg $\begin{pmatrix} 2 & 0.6 \\ 1 & 0.4 \end{pmatrix}$	2	B2 correct (B1 for a correct method to find the determinant **and** 2 other values correct in the correct position. For determinant $2\times10-(-3\times-5)$ allow $2\times10-3\times5$ oe Allow the presence of 5 or 1/5 with no contradictory work to imply this mark.) **or** 4 correct values in matrix in correct position. **and** an attempt to find the determinant – one error only involving multiplication of diagonals eg $2\times10+(-3\times-5)$ eg $2\times10-(-3\times5)$) If the correct matrix is seen in the working space, with the det then incorrectly included inside, isw.
	(c)		$\begin{pmatrix} 11 & -19 & -20 \\ -30 & 55 & 70 \end{pmatrix}$	2	B2 correct (B1 for 3, 4 or 5 correct values in the correct position)
		cas			***Total 6 marks***

Question		Working	Answer	Mark	Notes
22		$y=\frac{4-2x}{3}$ **and** $2\left(\frac{4-2x}{3}\right)=3x^2-\frac{10}{3}x+3$ oe or $x=\frac{4-3y}{2}$ **and** $2y=3\left(\frac{4-3y}{2}\right)^2-\frac{10}{3}\left(\frac{4-3y}{2}\right)+3$ oe		6	M1 for substituting a rearranged linear equation into the correct quadratic equation (or a rearranged quadratic equation into the correct linear equation) to form an un-simplified equation in one variable – allow one sign error only in the rearranged equation. This mark may be implied by a correct equation (simplified or unsmplified) in terms of x or y Eg $8-4x=9x^2-10x+9$
		$9x^2-6x+1(=0)$ or $81y^2-180y+100(=0)$ or or eg $18x^2-12x=-2$			M1 dep on 1st M mark for simplifying to a 3 term quadratic with least 2 terms correct (oe so look for signs reversed or any multiples of coefficients, doesn't need to = 0 if terms collected on one 'side')
		$(3x-1)^2(=0)$ oe or $\frac{6\pm\sqrt{(-6)^2-4\times9\times1}}{2\times9}$ oe or $(9y-10)^2(=0)$ or $\frac{180\pm\sqrt{(-180)^2-4\times81\times100}}{2\times81}$			M1 dep on 1st M mark for valid method to solve their quadratic. If factorising must multiply out to give 2 correct terms. Allow use of formula with one sign error. $[x=]\ \frac{-27\pm\sqrt{27^2-4\times3\times(-188)}}{2\times3}$. Allow completing the square with one sign error only. Implied by correct values. If not correct, method must be shown.
		$x=\frac{1}{3}$ oe or $y=\frac{10}{9}$ oe			A1 dependent on a correct quadratic for a correct value of x or y
		Eg $[y=]\frac{4-2\times"\frac{1}{3}"}{3}$ or $2\times"\frac{1}{3}"+3y=4$ or $[x=]\frac{4-3\times"\frac{10}{9}"}{2}$ or $2x+3\times"\frac{10}{9}"=4$			M1 Dep on 1st M. Substitute their value of x or y into a correct equation or expression or starting again and giving a correct unsimplified equation for the relevant variable. Implied by a correct pair of values. If values of x or y are incorrect then working must be shown If 2 values are found from an incorrect equation – only 1 needs to be substituted for the mark.
			$x=\frac{1}{3}$ oe **and** $y=\frac{10}{9}$		A1 oe dep on any previous 2 method marks being awarded Allow $x=0.\dot{3}$ or 0.3^r or 0.33... not 0.3 $x=1.\dot{1}$ or 1.1^r or 1.11... not 1.1
		wr			***Total 6 marks***

Question		Working	Answer	Mark	Notes
23	(a)	**(300 × 7) + (900 × 13) + (1500 × 28) + (2100 × 42) + (2700 × 10)** or 2100 + 11700 + 42000 + 88200 + 27000 [= 171000]		4	M2 for at least **3** correct products using the midpoints (need not be evaluated but must be added) **or** If not M2: M1 for at least 3 products using frequency and a value within the interval with intention to add (eg an (incorrect) total at the bottom of the table or on the page or an addition sign somewhere next to their products or totals). Condone use of the lower or upper bounds. The numbers used can be a mix of, for example, upper, lower and midpoint or any number in the interval. [upper bound products for example, are: 4200, 15600, 50400, 100800, 30000, total = 20100] [lower bound products for example, are: 0, 7800, 33600, 75600, 24000, total = 14100] **or** at least 3 correct products using midpoints without adding. If candidates are using upper or lower bounds or midpoints the evaluated products or the total will imply their working. If not, they must show what they are using to calculate their products.
		eg $\frac{"171000"}{100}$ or $\frac{"171000"}{7+13+28+42+10}$			M1 dep on at least M1 awarded Allow division by their Σf provided addition seen or total under column seen
			1710		A1
	(b)	$33\times100-2976(=324)$		3	M1 find the total for the 9 trainees
		$\frac{"324"}{9}$			M1 dep on 1st M mark for complete method to find the mean wage for the 9 trainees
			36		A1
		cas			***Total 7 marks***

Question		Working	Answer	Mark	Notes
24		$(AB^2 =)15^2 + 22^2 - 2\times15\times22\times\cos(125-50)$		6	M1 correct substitution into Cosine Rule to find *AB* or AB^2
		$(AB^2 =)538(.1794302)$			A1 for $538(.1794302)$ or $(AB =)23.(19869458)$ Correct answer can imply first M1 even though question states working required.
		$\frac{\sin ABL}{15} = \frac{\sin 75}{"23.19..."}$ or $15^2 = 22^2 + ("23.19...")^2 - 2\times22\times("23.19...")\cos ABL$ or $\frac{\sin LAB}{22} = \frac{\sin 75}{"23.19..."}$ Or $22^2 = 15^2 + ("23.19...")^2 - 2\times15\times("23.19...")\cos LAB$			M1 correct substitution into sine rule or cosine rule to find *ABL* (follow through candidate's *AB* provided *AB* is clearly labelled or on diagram or from correct working). or correct substitution into sine rule to find *LAB* (follow through candidate's *AB* provided *AB* is clearly labelled or on diagram or from correct working). This isn't a dependent mark, but it must be clear from diagram or working that students are using their value for *AB*

		$(\sin ABL =)\left(\frac{\sin 75}{"23.19..."}\times 15\right)$ or $(\sin ABL =)\left(\frac{14.489...}{"23.19..."}\right)$ or $(\sin ABL =)("0.0416..."\times 15)$ or $(\cos ABL =)\left(\frac{22^2+("23.19...")^2-15^2}{2\times 22\times("23.19...")}\right)$ or $(\cos ABL =)\left(\frac{"797.17..."}{"1020.74....."}\right)$ or $(\sin LAB =)\left(\frac{\sin 75}{"23.19..."}\times 22\right)$ or $(\sin LAB =)\left(\frac{21.250...}{"23.19..."}\right)$ or $(\sin ABL =)("0.0416..."\times 22)$ or $(\cos LAB =)\left(\frac{15^2+("23.19...")^2-22^2}{2\times 15\times("23.19...")}\right)$ $(\cos LAB =)\left(\frac{"279.17...."}{"695.96..."}\right)$			M1 full correct method to find angle *ABL* or angle *LAB* **Implies previous method mark.** **Allow this mark to be implied by** [*ABL* =] awrt 38 or awrt 39 [*LAB* =] awrt 66 or awrt 67 Again for info, you will see, for example, the following, if students find angle *LAB* first eg (*ABL*) = 180 – "66.35038218" – 75 or (see diagram) eg "66.35…." – 50
		eg $180+125+"38.6496..."[=343.6496...]$ or eg $270+35+"38.6496..."[=343.6496...]$ or eg 360 – "16.35038218" = $[=343.6496...]$			M1 (dep on the 2 previous M marks) correct method to find the bearing.
			344		A1 accept answers in the range [343.6, 344.1] Dep on awarding any 2 previous method marks
		wr			***Total 6 marks***


N
A
16 · 3504
Diagram NOT accurately drawn
15 km
50°
50°
66 · 3504
23.19...
N
75°
16 · 3504
38 · 64...
L
22 km
B

ALT

Question		Working		Answer	Mark	Notes
24		$\left[AB^2 =\right] 15^2 + 22^2 - 2\times 15\times 22\times \cos(125-50)$			6	M1 correct substitution into Cosine Rule to find *AB*
		$\left[AB^2 =\right] 538(.1794302)$				A1 (M1 on ePen) for $538(.1794302)$ or $(AB =)23.1(9869458)$ Correct answer can imply first M1 even though question states working required.
		$\left[\text{horizontal distance} =\right] 22\sin(180-125) - 15\sin(125-50)$ **and** $\left[\text{vertical distance} =\right] 22\cos(180-125) + 15\cos(125-75)$				M1 for method to find the vertical **and** the horizontal distance from A to B
		for $\tan\theta = \dfrac{"22\sin(180-125) - 15\sin(125-50)"}{"22\cos(180-125) + 15\cos(125-75)"}$ oe				M1 correct use of trig ratio Implies previous method mark. The correct angles imply this method mark $[\theta = 16.35...]$ accept awrt 16 or 17 $[\vartheta = 73.649\ldots]$ accept awrt 73 or 74
		or $\tan\vartheta = \dfrac{"22\cos(180-125) + 15\cos(125-75)"}{"22\sin(180-125) - 15\sin(125-50)"}$ oe				
		360 – "16.35…"oe	270 + "73.649…"oe			M1 (dep on previous 2 M marks) correct method to find the bearing
				344		A1 accept answers in the range [343.6, 344.1] Dep on awarding any 2 previous method marks
		cas				***Total 6 marks***

Question		Working		Answer	Mark	Notes Condone missing arrows throughout
25	(a)			$-\frac{1}{2}\mathbf{a}+3\mathbf{b}$	1	B1
	(b)	$\left(\overrightarrow{AN}=\right)\pm\frac{4}{5}(-\mathbf{a}+3\mathbf{b})$ $\left[\mathbf{a}+\frac{4}{5}(-\mathbf{a}+3\mathbf{b})\right]$	$\left(\overrightarrow{BN}=\right)\pm\frac{1}{5}(\mathbf{a}-3\mathbf{b})$ $\left[3\mathbf{b}+\frac{1}{5}(\mathbf{a}-3\mathbf{b})\right]$		2	M1 correct use of ratio on correct *AB* or *BA* Ignore any labelling.
				$\frac{1}{5}\mathbf{a}+\frac{12}{5}\mathbf{b}$		A1

	(c)	eg $\left[\overrightarrow{AX}=\overrightarrow{AO}+\overrightarrow{OX}\right]=-\mathbf{a}+\lambda(\text{"}\frac{1}{5}\mathbf{a}+\frac{12}{5}\mathbf{b}\text{")}$ eg $\left[\overrightarrow{AX}=\overrightarrow{AN}+\overrightarrow{NX}=\right]\frac{4}{5}(-\mathbf{a}+3\mathbf{b})+\mu(\text{"}-\frac{1}{5}\mathbf{a}-\frac{12}{5}\mathbf{b}\text{")}$		5	M1 for using the correct or their $\overrightarrow{ON}$ in a correct vector path for $\overrightarrow{AX}$ using any unknown parameter, in terms of **a** and **b**. The examples given are not the only possibilities. Candidates may use a negative parameter also. Longer routes may be used eg $\left(\overrightarrow{AX}=\overrightarrow{AB}+\overrightarrow{BO}+\overrightarrow{OX}=\right)-\mathbf{a}+3b-3b+\lambda(\text{"}\frac{1}{5}\mathbf{a}+\frac{12}{5}\mathbf{b}\text{")}$
		eg $\left[\overrightarrow{AX}=\overrightarrow{AM}+\overrightarrow{MX}=\right]-\frac{1}{2}\mathbf{a}+\beta(\text{"}-\frac{1}{2}\mathbf{a}+3\mathbf{b}\text{")}$ eg $\left[\overrightarrow{AX}=\overrightarrow{AB}+\overrightarrow{BX}=\right]-\mathbf{a}+3\mathbf{b}+\alpha(\text{"}-\frac{1}{2}\mathbf{a}+3\mathbf{b}\text{")}$			M1 for using the correct or their $\overrightarrow{MB}$ in a correct vector path for $\overrightarrow{AX}$ using any unknown different parameter, in terms of **a** and **b**. The 2 examples given are not the only possibilities.a negative parameter also.
		Eg $\text{"}-1+\frac{1}{5}\lambda\text{"}=\text{"}-\frac{1}{2}-\frac{1}{2}\beta\text{"}$ and $\text{"}\frac{12}{5}\lambda=3\beta\text{"}$ **or** $\text{"}-1+\frac{1}{5}\lambda\text{"}=\text{"}-1-\frac{1}{2}\alpha\text{"}$ and $\text{"}\frac{12}{5}\lambda=3-\frac{1}{2}\alpha\text{"}$ **or** $\text{"}-1-\frac{1}{5}\mu\text{"}=\text{"}-\frac{1}{2}-\frac{1}{2}\beta\text{"}$ and $3-\text{"}\frac{12}{5}\mu=3\beta\text{"}$ **or** $\text{"}-1-\frac{1}{5}\mu\text{"}=\text{"}-1-\frac{1}{2}\alpha\text{"}$ and $3-\text{"}\frac{12}{5}\mu=3\alpha\text{"}$			M1 dep both previous M marks, for correctly setting expressions equal (to each other) and forming two equations in their parameters. Each equation must involve 2 parameters.
		Eg $\lambda=\frac{5}{6}$ **or** $\mu=\frac{1}{6}$ **or** $\beta=\frac{2}{3}$ **or** $\alpha=-\frac{1}{3}$			A1 for either parameter correct, is implied by a correct final vector or eg $\overrightarrow{OX}=\frac{1}{6}\mathbf{a}+2\mathbf{b}$ $\overrightarrow{MX}=-\frac{1}{3}\mathbf{a}+2\mathbf{b}$ $\overrightarrow{BX}=\frac{1}{6}\mathbf{a}-\mathbf{b}$ $\overrightarrow{NX}=-\frac{1}{30}\mathbf{a}-\frac{2}{5}\mathbf{b}$ These will depend on the path chosen, for example if using $\overrightarrow{BX}$ rather than $\overrightarrow{MX}$ with μ positive in the vector path
			$-\frac{5}{6}\mathbf{a}+2\mathbf{b}$		A1oe eg. $\frac{12\mathbf{b}-5\mathbf{a}}{6}$

ALT1 (c)		eg $\left[\overrightarrow{MX}=\overrightarrow{MO}+\overrightarrow{OX}=\right]-\frac{1}{2}\mathbf{a}+\lambda(\text{"}\frac{1}{5}\mathbf{a}+\frac{12}{5}\mathbf{b}\text{"})$ eg $\left[\overrightarrow{MX}=\overrightarrow{MA}+\overrightarrow{AN}+\overrightarrow{NX}=\right]$ $\frac{1}{2}\mathbf{a}+\frac{4}{5}(-\mathbf{a}+3\mathbf{b})-\alpha(\text{"}\frac{1}{5}\mathbf{a}+\frac{12}{5}\mathbf{b}\text{"})$		5	M1 for using correct or their $\overrightarrow{ON}$ in a correct vector path for $\overrightarrow{MX}$ using any unknown parameter, in terms of **a** and **b**. The examples given are not the only possibilities. Candidates may also for example use a negative parameter or a longer path.
		$\left[\overrightarrow{MX}=\mu\overrightarrow{MB}=\right]\mu\left(\text{"}-\frac{1}{2}\mathbf{a}+3\mathbf{b}\text{"}\right)$			M1 for using $\mu\left(\text{correct or their}\overrightarrow{MB}\right)$ and any unknown different parameter, in terms of **a** and **b**. The example given is not the only possibility, they may also for example use a negative parameter.
		Eg $\text{"}-\frac{1}{2}+\frac{1}{5}\lambda=-\frac{1}{2}\mu\text{"}$ **and** $\text{"}\frac{12}{5}\lambda=3\mu\text{"}$ Eg $\text{"}-\frac{3}{10}-\frac{1}{5}\alpha=-\frac{1}{2}\mu\text{"}$ **and** $\text{"}\frac{12}{5}-\frac{12}{5}\alpha=3\mu\text{"}$			M1 dep both previous M marks, for correctly setting expressions equal (to each other) and forming two equations in their parameters. Each equation must involve 2 parameters.
		$\left[\overrightarrow{MX}=\right]-\frac{1}{3}\mathbf{a}+2\mathbf{b}$ $\left[\lambda=\frac{5}{6}\ \ \mu=\frac{5}{6}\ \ \alpha=\frac{1}{6}\right]$			A1 for correct $\overrightarrow{MX}$ May be implied by correct vectors or correct parameters eg $\overrightarrow{OX}=\frac{1}{6}\mathbf{a}+2\mathbf{b}\quad\overrightarrow{BX}=\frac{1}{6}\mathbf{a}-\mathbf{b}\ \ \overrightarrow{NX}=-\frac{1}{30}\mathbf{a}-\frac{2}{5}\mathbf{b}$
			$-\frac{5}{6}\mathbf{a}+2\mathbf{b}$		A1oe eg. $\frac{12\mathbf{b}-5\mathbf{a}}{6}$

ALT2 (c)		eg $\left[\overrightarrow{OX} = \lambda\overrightarrow{ON} =\right] \lambda(\text{"}\frac{1}{5}\mathbf{a} + \frac{12}{5}\mathbf{b}\text{"})$			M1 for using $\lambda\left(\text{correct or their } \overrightarrow{ON}\right)$ and any unknown parameter,in terms of **a** and **b**. The example given is not the only possibility, they may also for example use a negative parameter.
		eg $\left[\overrightarrow{OX} = \overrightarrow{OM} + \overrightarrow{MX}\right] = \frac{1}{2}\mathbf{a} + \mu(\text{"}-\frac{1}{2}\mathbf{a} + 3\mathbf{b}\text{"})$ eg $\left[\overrightarrow{OX} = \overrightarrow{OB} + \overrightarrow{BX} =\right] 3\mathbf{b} + \alpha(\text{"}\frac{1}{2}\mathbf{a} - 3\mathbf{b}\text{"})$			M1 for using the correct or their $\overrightarrow{MB}$ in a correct vector path for $\overrightarrow{OX}$ using any unknown different parameter, in terms of **a** and **b**. The examples given are not the only possibilities. Candidates may use a negative parameter also or a longer path.
		eg $\text{"}\frac{1}{5}\lambda = \frac{1}{2} - \frac{1}{2}\mu\text{"}$ **and** $\text{"}\frac{12}{5}\lambda = 3\mu\text{"}$ eg $\text{"}\frac{1}{5}\lambda = \frac{1}{2}\alpha\text{"}$ **and** $\text{"}\frac{12}{5}\lambda = 3 - 3\alpha\text{"}$			M1 dep both previous M marks, for correctly setting expressions equal (to each other) and forming two equations in their parameters. Each equation must involve 2 parameters.
		eg $\left[\overrightarrow{OX} =\right] \frac{1}{6}\mathbf{a} + 2\mathbf{b}$ $\left[\lambda = \frac{5}{6} \quad \mu = \frac{2}{3} \quad \alpha = \frac{1}{3}\right]$			May be implied by correct vectors eg $\overrightarrow{MX} = -\frac{1}{3}\mathbf{a} + 2\mathbf{b} \quad \overrightarrow{BX} = \frac{1}{6}\mathbf{a} - \mathbf{b} \quad \overrightarrow{NX} = -\frac{1}{30}\mathbf{a} - \frac{2}{5}\mathbf{b}$
			$-\frac{5}{6}\mathbf{a} + 2\mathbf{b}$		A1oe eg. $\frac{12\mathbf{b} - 5\mathbf{a}}{6}$

ALT3 (c)		$\left[\overrightarrow{OM}=\overrightarrow{OX}+\overrightarrow{XM}\right]$ $\frac{1}{2}\mathbf{a}=\lambda(\text{"}\frac{1}{5}\mathbf{a}+\frac{12}{5}\mathbf{b}\text{"})+\mu(\text{"}\frac{1}{2}\mathbf{a}-3\mathbf{b}\text{"})$		5	M1 for either $\lambda\left(\text{correct or their }\overrightarrow{ON}\right)$ or $\mu\left(\text{correct or their}\overrightarrow{MB}\right)$ M2 for $\frac{1}{2}\mathbf{a}=\lambda\left(\text{correct or their }\overrightarrow{ON}\right)+\mu\left(\text{correct or their}\overrightarrow{MB}\right)$ The example given is not the only possibility, they may also for example use a negative parameter or a longer path.
		eg $\text{"}\frac{1}{5}\lambda+\frac{1}{2}\mu=\frac{1}{2}\text{"}$ **and** $\text{"}\frac{12}{5}\lambda-3\mu=0\text{"}$			M1 dep both previous M marks, for correctly setting expressions equal (to each other) and forming two equations in their parameters. Each equation must involve 2 parameters.
		Eg $\lambda=\frac{5}{6}$ or $\mu=\frac{2}{3}$			A1 for either parameter correct, is implied by a correct final vector May be implied by correct $\overrightarrow{OX}=\frac{1}{6}\mathbf{a}+2\mathbf{b}$ $\overrightarrow{MX}=-\frac{1}{3}\mathbf{a}+2\mathbf{b}$ $\overrightarrow{BX}=\frac{1}{6}\mathbf{a}-\mathbf{b}$ These will depend on the path chosen, for example if using a negative parameter or both signs reversed in a vector
			$-\frac{5}{6}\mathbf{a}+2\mathbf{b}$		A1oe eg. $\frac{12\mathbf{b}-5\mathbf{a}}{6}$

ALT4 (c)		eg $\left[\overrightarrow{BX}=\overrightarrow{BO}+\overrightarrow{OX}=\right]-3\mathbf{b}+\lambda(\text{"}\frac{1}{5}\mathbf{a}+\frac{12}{5}\mathbf{b}\text{")}$ eg $\left[\overrightarrow{BX}=\overrightarrow{BN}+\overrightarrow{NX}=\right]\frac{1}{5}(\mathbf{a}-3\mathbf{b})-\alpha(\text{"}\frac{1}{5}\mathbf{a}+\frac{12}{5}\mathbf{b}\text{")}$		5	M1 for using correct or their $\overrightarrow{ON}$ in a correct vector path for $\overrightarrow{BX}$ using any unknown parameter, in terms of **a** and **b**. The examples given are not the only possibilities. Candidates may also for example use a negative parameter or longer paths.
		$\left(\overrightarrow{BX}=\alpha\overrightarrow{BM}=\right)\alpha\left(\text{"}\frac{1}{2}\mathbf{a}-3\mathbf{b}\text{"}\right)$			M1 for using $\alpha\left(\text{correct or their}\overrightarrow{MB}\right)$ and any unknown different parameter, in terms of **a** and **b**. The example given is not the only possibility, they may also for example use a negative parameter.
		Eg $\text{"}\frac{1}{5}\lambda=\frac{1}{2}\alpha\text{"}$ **and** $\text{"}-3+\frac{12}{5}\lambda=-3\alpha\text{"}$ Eg $\text{"}-\frac{3}{5}+\frac{12}{5}\mu=-3\alpha\text{"}$ **and** $\text{"}\frac{1}{5}+\frac{1}{5}\mu=\frac{1}{2}\alpha\text{"}$			M1 dep both previous M marks, for correctly setting expressions equal (to each other) and forming two equations in their parameters. Each equation must involve 2 parameters.
		$\overrightarrow{BX}=\frac{1}{6}\mathbf{a}-\mathbf{b}$ $\left[\lambda=\frac{5}{6}\ \ \mu=\frac{2}{3}\ \ \alpha=\frac{1}{3}\right]$			A1 for correct $\overrightarrow{MX}$ May be implied by correct vectors or correct parameters eg $\overrightarrow{OX}=\frac{1}{6}\mathbf{a}+2\mathbf{b}\ \ \overrightarrow{MX}=-\frac{1}{3}\mathbf{a}+2\mathbf{b}\ \ \overrightarrow{NX}=-\frac{1}{30}\mathbf{a}-\frac{2}{5}\mathbf{b}$
			$-\frac{5}{6}\mathbf{a}+2\mathbf{b}$		A1oe eg. $\frac{12\mathbf{b}-5\mathbf{a}}{6}$

ALT5 (c)		eg $\left[\overrightarrow{NX}=\lambda\overrightarrow{NO}=\right]\lambda("-\frac{1}{5}\mathbf{a}+-\frac{12}{5}\mathbf{b}")$			M1 for using $\lambda\left(\text{correct or their } \overrightarrow{NO}\right)$ and any unknown parameter,in terms of **a** and **b**. The example given is not the only possibility, they may also for example use a negative parameter.
		eg $\left[\overrightarrow{NX}=\overrightarrow{NB}+\overrightarrow{BX}=\right]\frac{1}{5}\left(-\mathbf{a}+3\mathbf{b}\right)+\mu("\frac{1}{2}\mathbf{a}-3\mathbf{b}")$ eg $\left[\overrightarrow{NX}=\overrightarrow{NA}+\overrightarrow{AM}+\overrightarrow{MX}=\right]$ $\frac{4}{5}\left(\mathbf{a}-3\mathbf{b}\right)-\frac{1}{2}\mathbf{a}+\alpha("-\frac{1}{2}\mathbf{a}+3\mathbf{b}")$			M1 for using the correct or their $\overrightarrow{MB}$ in a correct vector path for $\overrightarrow{NX}$ using any unknown different parameter, in terms of **a** and **b**. The examples given are not the only possibilities. Candidates may use a negative parameter also or a longer path.
		eg $"-\frac{1}{5}\lambda=-\frac{1}{5}+\frac{1}{2}\mu"$ **and** $"-\frac{12}{5}\lambda=\frac{3}{5}-3\mu"$ eg $"-\frac{1}{5}\lambda=\frac{4}{5}-\frac{1}{2}-\frac{1}{2}\alpha"$ **and** $"-\frac{12}{5}\lambda=-\frac{12}{5}+3\alpha"$			M1 dep both previous M marks, for correctly setting expressions equal (to each other) and forming two equations in their parameters. Each equation must involve 2 parameters.
		eg $\overrightarrow{NX}=-\frac{1}{30}\mathbf{a}-\frac{2}{5}\mathbf{b}$ $\left[\lambda=\frac{1}{6}\ \ \mu=\frac{1}{3}\ \ \alpha=\frac{2}{3}\right]$			May be implied by correct vectors eg $\overrightarrow{MX}=-\frac{1}{3}\mathbf{a}+2\mathbf{b}\ \ \overrightarrow{BX}=\frac{1}{6}\mathbf{a}-\mathbf{b}\ \ \overrightarrow{OX}=\frac{1}{6}\mathbf{a}+2\mathbf{b}$
			$-\frac{5}{6}\mathbf{a}+2\mathbf{b}$		A1oe eg. $\frac{12\mathbf{b}-5\mathbf{a}}{6}$

Question		Working	Answer	Mark	Notes
26	(a)	$3x+2x<15+5$ oe or $-5-15<-2x-3x$ oe		2	M1 isolating x terms and constant terms in a correct inequality or allow for just 4 on answer line or in working allow signs to be =, >, < , ≤ or ≥
			$x<4$		A1 For this question allow $x < 4$ in working and just 4 on answer line. $(-\infty, 4)$ or $[-\infty, 4)$
	(b)	x^2-x-6 $[>0]$ oe eg $(x-3)(x+2)[>0]$		3	M1 oe correctly rearranged does not need > 0
		$(x=)3$ **and** $(x=)-2$			A1 dep on M1
			$x<-2$ $x>3$		A1 ft dep on M1 Allow $(-\infty,-2) \cup (3,\infty)$ or $[-\infty,-2) \cup (3,\infty]$ Must have both of these must be written as two separate inequalities ie not as $-2>x>3$
	(c)		$x<-2$ $3<x<4$	2	B2 for both inequalities correct and clearly listed as final answer if not on answer line. Allow $(-\infty,-2) \cup (3,4)$ or $[-\infty,-2) \cup (3,4)$ B1 for $3 < x < 4$ Allow $(3,4)$
		(a) cas (b) wr (c) cas			***Total 7 marks***

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