Pearson Edexcel

Mark Scheme (Results)

Summer 2025

Pearson Edexcel International GCSE
In Mathematics A Modular (4WM2H) Paper 01
Unit 2H Higher Tier

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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
- 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 mark the one that leads to the answer on the answer line. If there is no answer given then mark the method that gives the lowest mark and award this mark.
  If there is no answer on the answer line then check the working for an obvious answer.
- **Ignoring subsequent work**
  It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: eg. Incorrect cancelling of a fraction that would otherwise be correct.
  It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect eg algebra.
  Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.
- **Parts of questions**
  Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

International GCSE Maths				
Values in quotation marks must come from a correct method previously seen unless clearly stated otherwise.				
Question	**Working**	**Answer**	**Mark**	**Notes**
1		1^{st} card = 4	3	B1
		2^{nd} card = 6		B1 or a list of 6 numbers with a mode of 6
		4^{th} card = 9		B1
				SCB2 for 4, 6 and 9 in the incorrect order
				Total 3 marks

Question	**Working**	**Answer**	**Mark**	**Notes**
2	$\left(\frac{8+12}{2}\times 3\right)(=30)$ or $3\times 8+0.5\times 4\times 3\ (=30)$ 9×5 (= 45) 9×8 (= 72) 9×12 (= 108) 9×3 (= 27)		3	M1 For a correct method to find the areas of 2 different faces
	$\left(\frac{8+12}{2}\times 3\right)(=30)$ or $3\times 8+0.5\times 4\times 3\ (=30)$ 9×5 (= 45) 9×8 (= 72) 9×12 (= 108) 9×3 (= 27) "30" + "30"+ "45" + "72" + "108" + "27"			M1 For adding together the area of 5 or 6 faces, at least 4 of which are from a correct method
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	312		A1 cao
				Total 3 marks

Question	Working	Answer	Mark	Notes
3	8000 – 5600 (= 2400) or 5600 – 8000 (= –2400) $\frac{5600}{8000}(=0.7)$ or $8000x = 5600$		3	M1
	$\frac{8000-5600}{8000}(\times 100)\ (=0.3\ (\times 100))$ or $\frac{5600-8000}{8000}(\times 100)\ (=-0.3\ (\times 100))$ or 0.7 × 100 (=70) (1 – 0.7) (= 0.3)			M1 A correct calculation for the percentage loss or seeing 0.3 or 70 as either the answer or in part of the working or an answer of – 30
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	30		A1 SCB1 if no marks scored for an answer of 42.8(57…) truncated or rounded
				Total 3 marks

Question	Working	Answer	Mark	Notes
4		Bisector with construction arcs	2	B2 B2 for a fully correct perpendicular bisector with 2 pairs of intersecting arcs shown (the line and the arcs can intersect on or within the overlay guidelines) (B1 for 2 pairs of intersecting arcs and no perpendicular bisector drawn or for a correct bisector perpendicular drawn within or on guidelines but no arcs or insufficient arcs or one pair of intersecting arcs and perpendicular bisector drawn on just one side of *AB*) NB Overlay is available
				Total 2 marks

Question		Working	Answer	Mark	Notes
5	(a)		$4n + 7$	2	B2 oe eg $11 + (n - 1)4$ (B1 for $4n$….)
	(b)	$3^{rd} = 19$ $5^{th} = 29$ $11^{th} = 59$ $15^{th} = 79$ $21^{st} = 109$ ….etc	eg 19 or 29 or 59 or 79 etc	1	B1 one or more numbers that are in the sequence and are prime numbers with no incorrect numbers
					Total 3 marks

Question	Working	Answer	Mark	Notes
6 (a)	$\frac{10}{4}\left(=\frac{5}{2}=2.5\right)$ or $\frac{4}{10}\left(=\frac{2}{5}=0.4\right)$ or $\frac{x}{5}=\frac{10}{4}$ oe or $\frac{x}{10}=\frac{5}{4}$ oe		2	M1 for a correct SF can be expressed as a fraction, decimal or ratio (may or may not be used) or for a correct equation in x Allow any letter for x
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	12.5		A1 oe eg $\frac{50}{4}$ or $\frac{25}{2}$ or $12\frac{1}{2}$ or $12\frac{2}{4}$
(b)	24 ÷ [2.5] oe or $\frac{y}{24}=\frac{4}{10}$ oe or $\frac{y}{24}=\frac{5}{[12.5]}$ oe or $\frac{y}{4}=\frac{24}{10}$ oe or $\frac{y}{5}=\frac{24}{[12.5]}$ oe		2	M1 ft ie [2.5] is their SF from (a) or for a correct equation in y Allow any letter for y ft their answer to (a) ie [12.5] is their answer to (a)
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	9.6		A1 oe eg $\frac{48}{5}$ or $9\frac{3}{5}$ If (a) x = 9.6 and (b) y = 12.5 then M1A0M1A0
				Total 4 marks

Question	Working	Answer	Mark	Notes
7	240 ÷ (3 + 4 + 5) (= 20) or $240\times\frac{3}{3+4+5}\left(=60\right)$ oe or $240\times\frac{4}{3+4+5}\left(=80\right)$ oe or $240\times\frac{5}{3+4+5}\left(=100\right)$ oe		4	M1 for a correct method to find the value of one share NB (240 ÷ 3 =) 80, (240 ÷ 4 =) 60 and (240 ÷ 5 =) 48 scores M0
	For two of (Pau:) 3 × "20" + 10 + 10 (= 80) or "60" + 10 + 10 (= 80) (Sam:) 4 × "20" – 10 (= 70) or "80" – 10 (= 70) (Tia:) 5 × "20" – 10 (= 90) or "100" – 10 (= 90)			M1 for the correct values for 2 of the people after S and T give P £10
	80, 70 and 90 or eg 9 : 7 : 8 oe or eg 4 : 3.5 : 4.5 oe			M1 for all 3 of 80, 70, and 90 correct (ignore units) or for the correct values for the final ratio in the wrong order (ignore units) or for the correct values for the final ratio unsimplified (ignore units)
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	8 : 7 : 9		A1 other orders are acceptable if labelled correctly on the answer line or working
				Total 4 marks

Question	Working	Answer	Mark	Notes
8	$5 \times x + 15 \times 3 + 25 \times 2 + 35 \times 4 + 45 \times 2$ oe $5x + 45 + 50 + 140 + 90$ oe eg $5x + 325$ (lower bound products 0. 30, 40, 120, 80) [sum of lower bound products is: 270] (upper bound products $10x$, 60, 60, 160, 100) [sum of upper bound products is: $10x + 380$]		4	M2 for at least **4** correct products added (need not be evaluated ie can be in the form $5 \times x + 15 \times 3 + \ldots$) **If not M2** then award: M1 for consistent use of values within interval (including end points) for at least **4** products added (need not be evaluated ie can be in the form $10 \times x + 20 \times 3 + \ldots$) or correct midpoints used for at least **4** products and not added
	$\frac{"5x+325"}{x+11} = 20$ or $"5x+325" = 20(x+11)$ oe			M1 (dep on at least M1) Dividing their Σfx by $x + 11$ and equating to 20 or equating their total times
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	7		A1 cao (SCB1 if no marks scored, for dividing by $x + 11$)
				Total 4 marks

Question	Working	Answer	Mark	Notes	
9	0.07 × 4000 (= 280) **or** 1.07 × 4000 (= 4280)		3	M1 for finding 7% of 4000 or 107% of 4000	M2 for $1.07^3 \times 4000$ or $1.07^4 \times 4000$ (= 5243….)
	4000 + 280 (= 4280) oe **and** 0.07 × 4280 (= 299.6) **and** 4280 + 299.6 (= 4579.6) **and** 0.07 × 4579.6 (= 320.572) **or** "280" + "299.6" + "320.572" (= 900(.172))			M1	
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	4900		A1 allow answers in the range 4900 – 4901 If no other mark awarded, SCB1 for 4000 × 0.07 × 3 (= 840) or 4000 × 0.21 (= 840) or 4000 + 4000 × 0.07 × 3 (= 4840) or 4000 × 1.21 (= 4840) or 0.93 × 4000 (= 3720) or 0.79 × 4000 (= 3160) or $0.93^3 \times 4000$ (= 3217…) or 4000×1.07^2 (= 4579…)	
					Total 3 marks

Question	Working		Answer	Mark	Notes	
10	eg $3x + 5y = 8$ $20x + 5y = -17.5$ _ **Subtracting** ($3x - 20x = 8 - -17.5$ or $-17x = 25.5$) **or** $3x + 5(-3.5 - 4x) = 8$ **or** $4x + \frac{8-3x}{5} = -3.5$	eg $12x + 20y = 32$ $12x + 3y = -10.5$ _ **Subtracting** ($20y - 3y = 32 - -10.5$ or $17y = 42.5$) **or** $3\left(\frac{-3.5-y}{4}\right) + 5y = 8$ **or** $4\left(\frac{8-5y}{3}\right) + y = -3.5$		3	M1	for a correct method to eliminate x or y: coefficients of x or y the same **and** correct operator to eliminate selected variable (condone any one arithmetic error in multiplication) **or** writing x or y in terms of the other variable and correctly substituting (condone missing brackets) NB: the mark is for the method and not for the result of the method. However, if the correct result of the method is seen, the mark can be awarded
	$3\times$"-1.5" $+ 5y = 8$ **or** $4 \times$ "-1.5" $+ y = -3.5$ **or** $y = -3.5 - 4\times$"-1.5" **or** $y = \frac{8-3\times"-1.5"}{5}$	$3x + 5 \times$ "2.5" $= 8$ **or** $4x +$ "2.5" $= -3.5$ **or** $x = \frac{-3.5-"2.5"}{4}$ **or** $x = \frac{8-5\times"2.5"}{3}$			M1	dep on first M1for a correct method to find other variable by substitution of found variable into one equation **or** for repeating the above method to find the second variable.
	Working required		$x = -1.5$ $y = 2.5$		A1	oe dep on M1
						Total 3 marks

Question	Working	Answer	Mark	Notes
11 (a)	$-3t - 2t < 15 - 7$ or $-5t < 8$ oe or $7 - 15 < 2t + 3t$ or $-8 < 5t$ oe or $t = -1.6$ or $t < -1.6$		2	M1 for correctly isolating terms in t on one side and number terms on the other side (use of = or any inequality symbol or variable is permitted)
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	$t > -1.6$		A1 oe eg $-1.6 < t$ or $t > -\frac{8}{5}$ or $-\frac{8}{5} < t$ oe Must have correct inequality symbol on answer line NB Sight of correct answer in working space and just $(t =) -1.6$ oe on answer line gains M1 only
(b)		$x \geq 2$	3	B1 oe allow $x > 2$ or $2 < x$
		$y \geq 3$		B1 oe allow $y > 3$ or $3 < y$
		$x + y \leq 9$		B1 oe allow $x + y < 9$ or $y < 9 - x$ or $9 > x + y$ SC B2 for all of $x \leq 2$, $y \leq 3$, $x + y \geq 9$ oe or $x < 2$, $y < 3$, $x + y > 9$ SC B1 for all of $x = 2$, $y = 3$, $x + y = 9$ oe
				Total 5 marks

Question	Working	Answer	Mark	Notes
12 (a)		0.000 086	1	B1 cao
(b)	0.5×10^6 or 5×10^n or $500\,000$ or $\frac{1}{2}\times10^6$		2	M1
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	5×10^5		A1 Accept 5.10^5
				Total 3 marks

Question	Working	Answer	Mark	Notes
13 (a)(i)		56	1	B1
(a)(ii)		Correct reason	1	B1 dep <u>alternate segment</u> theorem. (Allow "alt" for alternate and "seg" for segment as a minimum.)
(b)	*ACD* = 42 or *BAC* = 22 or *CBD* = 60		2	M1 For angle *ACD* or *BAC* or *CBD* (must be labelled or shown clearly on the diagram or in working). For any one of these correct.
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	22		A1 cao
				Total 4 marks

Question	Working	Answer	Mark	Notes
14 (a)		8, 21, 33, 50, 57, 60	1	B1
(b)	(NB A histogram/bar chart type graph scores zero marks unless a CF diagram is drawn over their histogram/bar chart) (Ignore any part of the graph before (10, 8))		2	M1 for at least 5 points plotted correctly at end of interval **or** ft from an ascending table (ft from a table with only one arithmetic error that may be continued through table) for all 6 points plotted consistently within each interval in the **freq table** at the correct height
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	Correct cf diagram		A1 for fully correct plotting with points joined accept curve or line segments accept curve that is not joined at (0, 0)
(c)		27 – 28	1	B1 accept answer in the range or ft an ascending graph
(d)	(60 –) 54		2	M1 ft for a line going up from the *x*-axis at 45 to the line and across to the *y*-axis **or** for a mark on the line at the correct point **or** for a correct reading from the vertical scale eg 54 or 53.5
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	5 or 6 or 7		A1 accept integer value 5 or 6 or 7 or ft from their ascending graph for an integer value
				Total 6 marks

Question	Working	Answer	Mark	Notes
15	1.12 oe or 0.85 oe		3	M1 or use of a value for the painting eg 1.12 × 200 = 224 or eg 1.12 × 50 = 56 oe
	1.12 × 0.85 oe or 0.952 oe			M1 or use of a figure eg 0.85 × "224" = 190.4 or eg 0.85 × "56" = 47.6
	Working is not required, so correct answer scores full marks (unless from obvious incorrect working)	4.8		A1 Allow – 4.8
				Total 3 marks

Question	Working	Answer	Mark	Notes
16	19 and 10 clearly identified eg circled in list or for stating 3rd and 9th		2	M1 For identifying the correct value or position of both quartiles
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	9		A1
				Total 2 marks

Question	Working	Answer	Mark	Notes
17 (a)	$2^8 \times 3^4 \times 5^{10}$ or $3^6 \times 5^{12} \times 2^{15} \times 3^6 \times 2^9 \times 5^{18}$		2	M1 *ABC* simplified or $A^3B^3C^3$ unsimplified (may include brackets) or 2 terms of the final answer correct
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	$2^{24} \times 3^{12} \times 5^{30}$		A1
(b)	$3 \times 5 \times 10^{290}$ or 15×10^{290} or 1.5×10^{291} or $(2 \times 5)^{290}$ or $2^{290} \times 5^{290}$ (from 10^{290})		2	M1
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	$2^{290} \times 3 \times 5^{291}$		A1
				Total 4 marks

Question	Working	Answer	Mark	Notes		
18	$W = \frac{k}{y^2}$ or $Wy^2 = k$ or $y^2 = \frac{k}{W}$ or $k_1 W = \frac{1}{y^2}$ oe		3	M1	Do not award for $W = \frac{1}{y^2}$ The constant of proportionality must be a symbol such as *k* Condone use of $\propto$ for method marks	M2 for $50 = \frac{k}{4^2}$ oe
	$50 = \frac{k}{4^2}$ or $50 \times 4^2 = k$ oe or $k = 800$			M1	For substitution of *W* and *y* into a correct formula	
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	$W = \frac{800}{y^2}$		A1	oe *W* must be the subject eg $W = 800(\times)\frac{1}{y^2}$ Award 3 marks if the answer is $W = \frac{k}{y^2}$ on the answer line and $k = 800$ clearly given in the body of working. SCB2 if M0 scored then award B2 for $W \propto \frac{800}{y^2}$	
						Total 3 marks

Question	Working	Answer	Mark	Notes	
	$7c-8ct^2=t^2+3$ oe		4	M1	for multiplying both sides by denominator **and** expanding the brackets
	$7c-3=t^2+8ct^2$ oe or $-8ct^2-t^2=3-7c$ oe			M1	ft dep on 2 terms in t^2 and 2 other terms for collecting t^2 terms on one side and other terms on the other side
	$7c-3=t^2(1+8c)$ oe or $t^2(-8c-1)=3-7c$ oe			M1	ft dep on previous M1 for factorising for t^2
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	$t=(\pm)\sqrt{\dfrac{7c-3}{1+8c}}$		A1	oe eg $t=(\pm)\sqrt{\dfrac{3-7c}{-8c-1}}$ or $t=(\pm)\left(\dfrac{7c-3}{1+8c}\right)^{\frac{1}{2}}$ or $t=(\pm)\left(\dfrac{7c-3}{1+8c}\right)^{0.5}$ NB To award A1 we must see $t=(\pm)\sqrt{\dfrac{7c-3}{1+8c}}$ in working if $(\pm)\sqrt{\dfrac{7c-3}{1+8c}}$ alone is given as an answer
					Total 4 marks

Question	Working	Answer	Mark	Notes	
20	3 correct algebraic terms for consecutive even numbers eg $2n$, $2n + 2$, $2n + 4$ oe **or** eg n, $n + 2$, $n + 4$ oe (ie for odd or even numbers) **or** eg $a = b - 2,\ c = b + 2$			M1	For 3 consecutive even numbers in algebraic form stated (any letter can be used) or used n, then proving for even and odd numbers or using a, b, or c
	eg $(ac =)\ 4n^2 + 8n$ or $(b^2 =)\ 4n^2 + 8n + 4$ **or** eg $(ac =)\ n^2 + 4n$ or **or** eg $(ac =)\ b^2 - 2b + 2b - 4$ oe			M1 (dep)	Working out ac or b^2
	eg $ac + 4 = 4n^2 + 8n + 4$ $b^2 = 4n^2 + 8n + 4$ eg $b^2 = n^2 + 4n + 4$ $b^2 = (n^2 + 4n) + 4 = ac + 4$ eg $b^2 = b^2 - 4 + 4$ oe (b is defined as even in the question)	Proof		A1	Fully correct proof shown by linking together the two expressions if used n, $n + 2$, $n + 4$ oe, then a statement is needed "as it is true for all consecutive odd and even numbers then it is true for all even numbers" oe if using a, b, or c no statement is needed because they have been defined as even numbers.
					Total 3 marks

Question		Working	Answer	Mark		Notes
21	(a)	$\dfrac{7\left(\dfrac{7x+20}{2x}\right)+20}{2\left(\dfrac{7x+20}{2x}\right)}\left(=6\right)$ or $\dfrac{7g+20}{2g}\left(=6\right)$ or $g=4$ or $\dfrac{7x+20}{2x}=6$ or $x=4$		3	M1	A correct expression for gg(x) or the first stage in finding the value of g that is to be entered into g(g(x)) = 6
		or $\dfrac{49x+140+40x}{14x+40}=6$ oe or $\dfrac{7x+20}{2x}=4$			M1	simplifying the numerator and denominator and equating to 6 or for the equation in x for g(x) = 4 NB Either of these correct equations would score M2
		Working required	20		A1	Dep on M2
	(b)	$(y=)\ 5(x^2+6x)-7$ oe or $(y=)\ 5\left(x^2+6x-\dfrac{7}{5}\right)$ oe or $5x^2+30x-(7+y)=0$ oe		4	M1	For a correct first step to complete the square. Allow y (= h^{-1}) in place of x or correctly setting up an equation = 0 or for – 52 for the CTS expression
		$(y=)\ 5[(x+3)^2-9]-7$oe eg $5(x+3)^2-52$ or $(y=)\ 5\left((x+3)^2-9-\dfrac{7}{5}\right)$ oe or $(x=)\dfrac{-30\pm\sqrt{30^2-4\times5\times-(7+y)}}{2\times5}$ oe			M1	For completing the square or correct substitution into the quadratic formula. Allow y (= h^{-1}) in place of x Note: M2 for $5(x+3)^2-52$
		$(x+3)^2=\dfrac{y+7+45}{5}$ oe or $x=\dfrac{-30\pm\sqrt{1040+20y}}{10}$			M1	Allow y (= h^{-1}) in place of x
		Working not required, so correct answer scores full marks (unless from obvious incorrect working)	$-3+\sqrt{\dfrac{x+52}{5}}$		A1	Must be in terms of x M3A0 for $-3\pm\sqrt{\dfrac{x+52}{5}}$
						Total 7 marks

Question	Working	Answer	Mark	Notes
22	$\left(\frac{dy}{dx} =\right) 3x^2 + 13x - 10$		4	M1 For one term differentiated correctly from $x^3, \frac{13}{2}x^2, -10x$
	$3x^2 + 13x - 10 = 0$			M1 For at least 2 of these terms correctly differentiated and the equation put = 0 or ≥ 0 or > 0 (or implied = 0 by attempt to factorise or substitute into formula or complete the square)
	Differentiation required	$-5,\ \frac{2}{3}$		A1 dep on M1 for both critical values
	Differentiation required	$x < -5,\ x > \frac{2}{3}$		A1 oe dep on M1 for correct inequalities (must be separate inequalities) allow $x \leq -5,\ x \geq \frac{2}{3}$ oe allow interval notation $(x \in)\quad (-\infty, -5)$ and/or $\left(\frac{2}{3}, \infty\right)$ or $\quad]-\infty, -5[$ and/or $\left]\frac{2}{3}, \infty\right[$ allow 0.6(666…) for $\frac{2}{3}$
				Total 4 marks

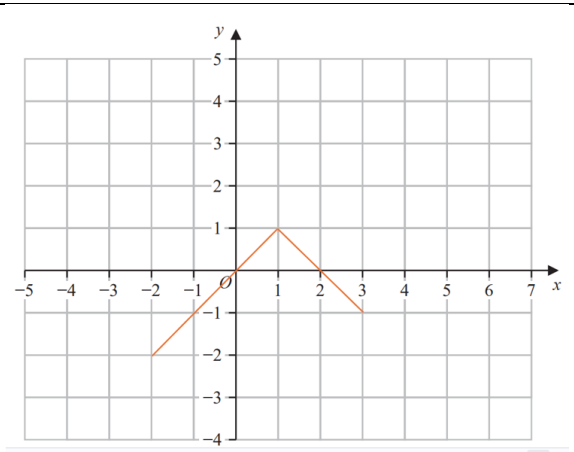
Question	Working	Answer	Mark	Notes
23	$3x \times 2x \times y = 1014$ oe or $6x^2y = 1014$ oe or $x^2y = 169$ oe		3	M1 for an equation for volume in terms of x and y
	$2\times 3x \times y + 2 \times 2x \times y + 2 \times 3x \times 2x$ oe or $2\times(3xy + 2xy + 6x^2)$ oe or $6xy + 4xy + 12x^2$ oe or $10xy + 12x^2$ oe			M1 (indep) for a correct expression for the surface area NB May not explicitly see the surface area expression in terms of y eg $2\times 3x \times \frac{169}{x^2} + 2 \times 2x \times \frac{169}{x^2} + 2 \times 3x \times 2x$ oe May be fully substituted using $y = \frac{169}{x^2}$ oe
	Using $y = \frac{1014}{6x^2}\left(= \frac{169}{x^2}\right)$ in formula for surface area to obtain correct expression eg (SA =) $2\times 5x \times \frac{169}{x^2} + 2 \times 6x^2 = 12x^2 + \frac{1690}{x}$ or equating their surface area equations eg $10xy + 12x^2 = 12x^2 + \frac{1690}{x}$ leading to $x^2y = 169$ oe	Shown		A1 dep on M2 For completing the 'show that' by clearly showing the stages that lead to the given expression for the surface area.
	Working required			**Total 3 marks**

Question	Working	Answer	Mark	Notes
24	$a + 20d = 109$ oe **or** $\frac{52}{2}\left(2a+(52-1)d\right)=4381$ oe		4	M1 **one** of the equations for 21st term or for the sum of 52 terms correct
	$a + 20d = 109$ **and** $\frac{52}{2}\left(2a+(52-1)d\right)=4381$			M1 **Both** of the equations for 21st term and for the sum of 52 terms correct
	$a = 199$ or $d = -4.5$			A1 Dep on M2 the correct value for a or for d
	Working required	181		A1 Dep on M2 cao
				Total 4 marks

Question	Working	Answer	Mark	Notes
25	**A** : **B** = 31 : 18.6 (= 5 : 3) oe **or** $\mathbf{A^3} : \mathbf{B^3} = 31^3 : 18.6^3$ $(= 5^3 : 3^3)$ oe **or** $\frac{31}{18.6}\left(=\frac{5}{3}\right)$oe **or** $\frac{18.6}{31}\left(=\frac{3}{5}\right)$oe **or** $\left(\frac{18.6}{31}\right)^3$ oe **or** $\frac{27}{125}$ oe **or** $\left(\frac{31}{18.6}\right)^3$ oe **or** $\frac{125}{27}$oe		4	M1 for correct linear SF or volume SF either as a fraction or ratio. Allow $\frac{5}{3}=1.6(6....)$ truncated or rounded
	$V_A-\left(\frac{3}{5}\right)^3 V_A(=735)$ oe **or** $V_A-\frac{27}{125}V_A(=735)$ oe **or** $\frac{98}{125}V_A(=735)$ oe **or** $\frac{V_A}{V_A-735}=\frac{31^3}{18.6^3}$ oe **or** $\left(\frac{5}{3}\right)^3 V_B-V_B(=735)$ oe **or** $\frac{125}{27}V_B-V_B(=735)$ oe **or** $\frac{98}{27}V_B(=735)$oe **or** $\frac{V_B+735}{V_B}=\frac{31^3}{18.6^3}$ oe **or** $1-\left(\frac{3}{5}\right)^3\left(=\frac{98}{125}=0.784\right)$oe **or** $\left(\frac{5}{3}\right)^3-1\left(=\frac{98}{27}=3.62(962...)\right)$oe **or** $5^3 - 3^3$ (= 125 – 27 = 98)			M1 **Note: 735 is given in the equation** Allow any letter for V_A or for V_B $V_A-\left(\frac{3}{5}\right)^3 V_A(=735)$ can be written as $V_A-\frac{V_A}{\left(\frac{5}{3}\right)^3}(=735)$ or $\left(\frac{5}{3}\right)^3 V_B-V_B(=735)$ can be written as $\frac{V_B}{\left(\frac{3}{5}\right)^3}-V_B(=735)$
	$(V_A=)735\times\frac{125}{98}$ oe **or** $(V_A=)735\div\frac{98}{125}$ oe **or** $(V_A=)\frac{31^3\times735}{31^3-18.6^3}$ oe or $(V_B=)735\times\frac{27}{98}(=202.5)$ oe **or** $(V_B=)735\div\frac{98}{27}(=202.5)$ **or** $(V_B=)\frac{18.6^3\times735}{31^3-18.6^3}(=202.5)$ oe **or** $735 \div 98 \times 5^3$ oe **or** 7.5×125 oe **or** $735 \div 98 \times 3^3$ (= 202.5) oe **or** 7.5×27 (= 202.5) oe			M1 for a correct method to find V_A or V_B
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	937.5		A1 oe allow 938 from correct working
				Total 4 marks

Question	Working	Answer	Mark	Notes
26(a)		$-3\mathbf{a}+3\mathbf{c}$	1	B1 oe eg $3(\mathbf{c}-\mathbf{a})$ need not be in simplest form
(b)	$\overrightarrow{QX}=\lambda\left(\left[3\mathbf{c}-3\mathbf{a}\right]\right)$ or $\overrightarrow{PX}=\mu(14\mathbf{c}-2\mathbf{a})$ or $\overrightarrow{XR}=\lambda\left(\left[3\mathbf{c}-3\mathbf{a}\right]\right)$ or $\overrightarrow{XT}=\mu(14\mathbf{c}-2\mathbf{a})$		4	M1 ft their $\overrightarrow{QR}$ from part (a) for introducing a parameter correctly where $\left(\left[3\mathbf{c}-3\mathbf{a}\right]\right)$ is their answer to part (a)
	$\overrightarrow{QX}=\lambda\left(\left[3\mathbf{c}-3\mathbf{a}\right]\right)$ **and** $\overrightarrow{QX}=-\mathbf{a}-3\mathbf{c}+\mu(14\mathbf{c}-2\mathbf{a})$ or $\overrightarrow{QX}=-\mathbf{a}-3\mathbf{c}-2\mathbf{a}+6\mathbf{c}+\delta\left(\left[3\mathbf{a}-3\mathbf{c}\right]\right)$ oe **and** $\overrightarrow{QX}=-\mathbf{a}-3\mathbf{c}+\mu(14\mathbf{c}-2\mathbf{a})$ or $\overrightarrow{PX}=\mu(14\mathbf{c}-2\mathbf{a})$ **and** $\overrightarrow{PX}=\mathbf{a}+3\mathbf{c}+\lambda\left(\left[3\mathbf{c}-3\mathbf{a}\right]\right)$ or $\overrightarrow{PX}=\mu(14\mathbf{c}-2\mathbf{a})$ **and** $\overrightarrow{PX}=-2\mathbf{a}+6\mathbf{c}+\delta\left(\left[3\mathbf{a}-3\mathbf{c}\right]\right)$			M1 ft their $\overrightarrow{QR}$ from part (a) for 2 correct expressions for $\overrightarrow{QX}$ or $\overrightarrow{PX}$ in terms of **a** and **c** where $\left(\left[3\mathbf{c}-3\mathbf{a}\right]\right)$ is their answer to part (a)
	eg $\overrightarrow{QX}: -3\lambda=-1-2\mu$ **and** $3\lambda=-3+14\mu$ or $\overrightarrow{QX}: -3+3\delta=-1-2\mu$ **and** $-3-3\delta=-3+14\mu$ or $\overrightarrow{PX}: -2\mu=1-3\lambda$ **and** $14\mu=3+3\lambda$ or $\overrightarrow{PX}: -2\mu=2+3\delta$ **and** $14\mu=6-3\delta$ $\lambda=\frac{5}{9},\delta=\frac{4}{9},\mu=\frac{1}{3}$			M1 Comparing coefficients for **a** and for **c** to give two correct equations or for one correct parameter **NB: Please refer to ALT mark scheme for ratio based on parallel lines**
	Working required	5 : 4		A1 Dep on M1 **and** a correct expression in (a)
				Total 5 marks

Question	Working	Answer	Mark	Notes
26 (b) **ALT**	$\overrightarrow{QX} = \lambda\left(\left[3\mathbf{c}-3\mathbf{a}\right]\right)$ or $\overrightarrow{PX} = \mu(14\mathbf{c}-2\mathbf{a})$ or $\overrightarrow{XR} = \lambda\left(\left[3\mathbf{c}-3\mathbf{a}\right]\right)$ or $\overrightarrow{XT} = \mu(14\mathbf{c}-2\mathbf{a})$		4	M1 ft their $\overrightarrow{QR}$ from part (a) for introducing a parameter correctly where $\left(\left[3\mathbf{c}-3\mathbf{a}\right]\right)$ is their answer to part (a)
	$\overrightarrow{PX} = \mathbf{a}+3\mathbf{c}+\lambda(3\mathbf{c}-3\mathbf{a})$ **and** $\overrightarrow{PT} = -2\mathbf{a}+14\mathbf{c}$ or $\overrightarrow{PX} = -2\mathbf{a}+6\mathbf{c}+\delta(3\mathbf{c}-3\mathbf{a})$ **and** $\overrightarrow{PT} = -2\mathbf{a}+14\mathbf{c}$ AND $\frac{1-3\lambda}{-2} = \frac{3+3\lambda}{14}$ or $\frac{-2+3\delta}{-2} = \frac{6-3\delta}{14}$ $\lambda = \frac{5}{9}; \delta = \frac{4}{9}$			M2 correct expressions $\overrightarrow{PX}$ and $\overrightarrow{PT}$ in terms of **a** and **c** AND using the property $\overrightarrow{PX}$ and $\overrightarrow{PT}$ are parallel eg ratio of **a** coefficients = ratio of **c** coefficients or for one correct parameter **if not M2 award M1 for complete method with one error**
	Working required	5 : 4		A1 Dep on M1 **and** a correct expression in (a)

Question	Working	Answer	Mark	Notes	
27(a)(i)		(10, –5)	1	B1	cao
(ii)		(2, –5)	1	B1	cao
(b)		Correct graph	2	B2	Graph from (–2, –2) to (1, 1) to (3, –1) If not B2 then B1 for graph from (–2, 1) to (1, 4) to (3, 2) or graph from (–4, –2) to (2, 1) to (6, –1) or two of (–2, –2), (1, 1), (3, –1) or for a graph going through the 3 correct points that has been extended
					Total 4 marks

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