Mark Scheme (Results)

Summer 2022

Pearson Edexcel International GCSE
In Mathematics A (4MA1)
Paper 1H

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Types of mark

- M marks: method marks
- A marks: accuracy marks
- B marks: unconditional accuracy marks (independent of M marks)

Abbreviations

- cao – correct answer only
- ft – follow through
- isw – ignore subsequent working
- SC - special case
- oe – or equivalent (and appropriate)
- dep – dependent
- indep – independent
- awrt – answer which rounds to
- eeoo – each error or omission

No working

- If no working is shown then correct answers normally score full marks
- If no working is shown then incorrect (even though nearly correct) answers score no marks.

With working

- If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
- If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks.
- If a candidate misreads a number from the question. Eg. Uses 252 instead of 255; method marks may be awarded provided the question has not been simplified.
- Examiners should send any instance of a suspected misread to review. If there is a choice of methods shown, 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

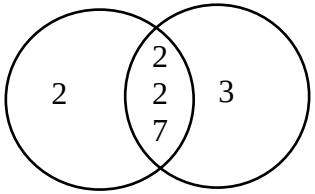
- It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: eg. Incorrect cancelling of a fraction that would otherwise be correct.
- It is not appropriate to ignore subsequent work when the additional work essentially 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

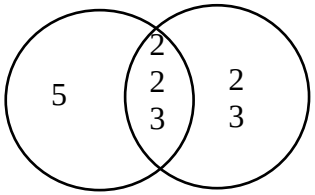
- Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded to another.

International GCSE Maths				
Apart from Questions 3, 5b, 6a, 16, 19 and 23 (where the mark scheme states otherwise), the correct answer, unless clearly obtained by an incorrect method, should be taken to imply a correct method.				
Q	**Working**	**Answer**	**Mark**	**Notes**
1 (a)			2	M1 for $4n + k$ ($k \neq -3$) or $4 \times n + k$ ($k \neq -3$) or $n \times 4 + k$ ($k \neq -3$) (k may be zero or absent)
		$4n - 3$		A1 oe e.g. $1 + (n - 1)4$ oe or $4 \times n - 3$ oe or $n \times 4 - 3$ oe NB: award full marks for eg $x = 4n - 3$ oe or $x = 4 \times n - 3$ oe or $x = n \times 4 - 3$ oe or nth term $= 4n - 3$ oe or nth term $= 4 \times n - 3$ oe or nth term $= n \times 4 - 3$ oe but only M1 for $n = 4n - 3$ oe
(b)		$6m + 5$	1	B1 for $3(2m) + 5$ oe or $6m + 5$ or $3 \times 2m + 5$ oe or $6 \times m + 5$ Allow $3(2n) + 5$ or $6n + 5$ oe
				Total 3 marks

2	1– (0.26 + 0.18) (= 0.56) oe or 0.28 oe or $x + x = 1 – (0.26 + 0.18)$ oe		4	M1 0.28 oe may be seen in the table
	45 ÷ 0.18 (= 250) oe or $\frac{45}{18}$ (= 2.5) oe $\frac{"0.56"}{2} \div 0.18 \left(= \frac{14}{9} = 1.55... \right)$ oe or $\frac{"56"}{2} \div 18 \left(= \frac{14}{9} = 1.55... \right)$			M1
	$"250" \times \frac{"0.56"}{2}$ oe or 2.5 × $\frac{"56"}{2}$ oe or $"250" \times "0.28"$ oe or $"0.28" \div 0.18 \times 45$ oe or $"\frac{14}{9}" \times 45$ oe or “28” ÷ 18 × 45 oe or $\frac{45}{18} \times "28"$ oe			M1
		70		A1 ($\frac{70}{250}$ scores M3A0)
				Total 4 marks

<table>
<tr><td>3 (a)</td><td>1, 2, 4, 7, 8, 14, 28, 56 and 1, 2, 3, 4, 6, 7, 12, 14, 21, 28, 42, 84
or
2 2 2 7 and 2 2 3 7
or
 

<table>
<tr><td colspan="3">e.g.</td></tr>
<tr><td>28</td><td>56</td><td>84</td></tr>
<tr><td></td><td>2</td><td>3</td></tr>
</table></td><td></td><td>2</td><td>M1 for any correct valid method and no errors e.g.

for starting to list at least four different factors of each number and no errors
or
2 2 2 7 and 2 2 3 7 seen
(may be in a factor tree or a ladder diagram and ignore 1)
or a fully correct Venn diagram
or other clear method, e.g, table</td></tr>
<tr><td></td><td></td><td>28</td><td></td><td>A1 dep M1 accept $2^2 \times 7$ oe</td></tr>
<tr><td>(b)</td><td>60, 120, 180, 240… and 72, 144, 216, 288…
or
2 2 3 5 and 2 2 2 3 3
or
 

<table>
<tr><td>2</td><td>60</td><td>72</td></tr>
<tr><td>2</td><td>30</td><td>36</td></tr>
<tr><td>3</td><td>15</td><td>18</td></tr>
<tr><td>2</td><td>5</td><td>6</td></tr>
<tr><td></td><td></td><td>3</td></tr>
</table>
or $\frac{60\times72}{12}$ or 2, 2, 2, 3, 3, 5 oe</td><td></td><td>2</td><td>M1 for any correct valid method and no errors e.g.

for starting to list at least four multiples of each number
or
2 2 3 5 and 2 2 2 3 3 seen
(may be in a factor tree or a ladder diagram and ignore 1)
or a fully correct Venn diagram
or other clear method, e.g, table</td></tr>
<tr><td></td><td></td><td>360</td><td></td><td>A1 dep M1 accept $2^3 \times 3^2 \times 5$ oe</td></tr>
<tr><td></td><td></td><td></td><td></td><td>Total 4 marks</td></tr>
</table>

4	$7x + 3x + 8x = 360$ oe		4	M1	M2 for $7x = 140$ (140 can be on diagram)
	$(x =)\ 360 \div 18\ (= 20)$			M1	
	$360 \div (180 - 7 \times$ "20") oe or $360 \div (180 -$ "140") $\frac{(n-2)\times 180}{n} = 7 \times$ "20" oe or $360 \div 40$			M1 for 360 ÷ exterior angle	
		9		A1	
					Total 4 marks

5	(a)	$n^2 - 6n + 4n - 24$		2	M1 for any 3 correct terms **or** for 4 out of 4 correct terms ignoring signs **or** for $n^2 - 2n$ … **or** for …$- 2n - 24$
			$n^2 - 2n - 24$		A1 oe
	(b)	$8x - 12$ **or** $\frac{3}{4}x - \frac{5}{4}$ oe or $0.75x - 1.25$ oe		3	M1 for correct multiplication by 4 **or** separate fractions on the RHS
		$8x - 3x = -5 + 12$ oe or $5x = 7$ oe **or** $2x - \frac{3}{4}x = -\frac{5}{4} + 3$ or $2x - 0.75x = -1.25 - 3$ oe			M1 ft (dep on 4 terms) for terms in x on one side of equation and number terms on the other
			$\frac{7}{5}$		A1 oe dep on M1 1.4 or $1\frac{2}{5}$ oe
					Total 5 marks

6	(a)	1 + 0.04 (= 1.04) **or** 100(%) + 4(%) (= 104(%)) **or** $\frac{634\ 400}{104}$ (= 6100) oe		3	M1	
		634 400 ÷ "1.04" **or** 634 400 ÷ "104" × 100 **or** 634 400 × 100 ÷ "104" oe			M1	
			No and 610 000		A1 dep on M2 for no and 610 000 seen oe E.g. Still (band) B and 610 000 oe	
	(b)	"0.85" × "0.85" (= 0.7225) oe **or** "0.85" – ("0.85" × 0.15) (= 0.7225) **or** $\frac{"85"\times"85"}{100}$ (= 72.25) oe or [0.85 and 85 must come from correct working]		3	M1 allow use of their amount e.g. 200 × "0.85" × "0.85" (= 144.5)	M2 for 15 + (0.15 × "85") or 15 + 12.75
		1 – "0.7225" **or** 0.2775 **or** 100 – "72.25"			M1 e.g. $\frac{200-"144.5"}{200}$ (×100)	
			27.75		A1 oe allow 27.8 or 28	
						Total 6 marks

7	$1.4 = \frac{72}{(\text{area})}$ oe		4	M1
	$(\text{area} =)\frac{72}{1.4}\left(= \frac{360}{7} = 51.4\ldots\right)$ oe			M1 (51.4 or better)
	"51.4…" × 18 **or** $r = \sqrt{\frac{"51.4..."}{\pi}}\ (= 4.046\ldots)$ **and** $\pi \times "4.046"^2 \times 18$			M1 allow use of πr^2 to find the radius and then using $\pi r^2 h$ to find the volume
		926		A1 Allow 925 – 928
				Total 4 marks

8	(a)		8.9×10^{-5}	1	B1
	(b)		83 400	1	B1
					Total 2 marks

9	(a)		8	1	B1
	(b)		11	1	B1 accept x^{11}
	(c)		$8k^6m^{12}$	2	B2 for all correct B1 for two correct from 8 or k^6 or m^{12}
					Total 4 marks

10	(a)	$(18-3)^2+(7--1)^2$ oe or $15^2+8^2\,(=289)$ oe		3	M1
		$\sqrt{(18-3)^2+(7--1)^2}$ (= $\sqrt{"289"}$)			M1
			17		A1
	(b)	13 + 6 > "17"	correct reason	1	A1ft dep M1 **Acceptable examples** "They overlap by 2cm" "The distance between the centres is less than the sum of the radii" "17 is less than the distance than the total of the radii" "19 is bigger than the distance between the centres" **Not acceptable examples** "19 is greater than the distance between the circles" oe "The circumference of each circle overlaps"
					Total 4 marks

11	(a)	$(3x \pm 2y)(3x \pm 2y)$ or $(3x)^2 - (2y)^2$		2	M1
			$(3x+2y)(3x-2y)$		A1
	(b)	$\frac{7(4x)}{32x} - \frac{8(x+3)}{32x}$ oe or $\frac{7(4x)}{8(4x)} - \frac{8(x+3)}{8(4x)}$ oe or $\frac{28x}{32x} - \frac{8(x+3)}{32x}$ oe or $\frac{28x}{32x} - \frac{8x+24}{32x}$ oe or $\frac{28x-8(x+3)}{32x}$ oe or $\frac{7x}{8x} - \frac{2(x+3)}{8x}$ oe or $\frac{7x-2(x+3)}{8x}$ oe		3	M1 for two correct fractions with common denominator **or** a single correct fraction
		$\frac{28x-8x-24}{32x}$ oe or $\frac{20x-24}{32x}$ oe or $\frac{7x-2x-6}{8x}$ oe or $\frac{20x}{32x} - \frac{24}{32x}$ oe or $\frac{28x}{32x} - \frac{8x}{32x} - \frac{24}{32x}$ oe			M1 for correct fraction(s) with bracket(s) expanded **and** dealing with the negative signs
			$\frac{5x-6}{8x}$		A1 or $\frac{-6+5x}{8x}$
					Total 5 marks

12	(a)		0.8 and 0.2 0.3 and 0.7 0.6 and 0.4	2	B2 for all 3 correct pairs of probabilities on the correct branches (B1 for 2 correct pairs of probabilities on the correct branches) Allow equivalent fractions
	(b)	"0.8" × "0.3"		2	M1ft (Both probabilities must be less than 1)
			0.24		A1ft oe
					Total 4 marks

13	$\frac{3}{8} + 45\%$ $\left(= \frac{33}{40}\right.$ or $82.5(\%)$ or $\left.0.825\right)$		5	M1 Do **NOT** award M1 for e.g. $\frac{3}{8} + 45(\%) + 406(= ....)$ oe
	$1 - \frac{"33"}{40}\left(= \frac{7}{40}\right)$ **or** $100 - "82.5"(\%)(= 17.5(\%))$ **or** $1 - "0.825"(= 0.175)$			M1
	$406 \div \frac{"7"}{40}$ (= 2320) **or** $406 \div \frac{"17.5"}{100}$ oe (= 2320) **or** 1% = 406 ÷ "17.5" (= 23.2) oe			M1
	0.45 × "2320" oe **or** 45 × "23.2" oe			M1
		1044		A1
				Total 5 marks

13 ALT	$\frac{3}{8}x + 0.45x + 406$ oe		5	M1 Do **NOT** award M1 for e.g. $\frac{3}{8} + 45(\%) + 406(= ....)$ oe
	$\frac{3}{8}x + 0.45x + 406 = x$ oe			M1 for a correct equation
	$(x =) \frac{406}{1 - \frac{3}{8} - 0.45}\left(= \frac{406}{7/40} = 2320\right.$			M1
	0.45 × "2320"			M1
		1044		A1
				Total 5 marks

14 (a)			5	1	B1 cao
(b)	$y(x-6)=2x$ or $yx-6y=2x$	$x(y-6)=2y$ or $xy-6x=2y$		3	M1 for multiplying the denominator
	$x(y-2)=6y$	$y(x-2)=6x$			M1 for isolating the x or y terms **and** factorising
			$\frac{6x}{x-2}$		A1 accept $\frac{-6x}{2-x}$ (must be a function of x)
					Total 4 marks

15	0.5^3 or $\frac{1}{8}$ or 0.125 oe		4	M1 for finding *DDD*
	0.3×0.2^2 or $\frac{3}{250}$ or 0.012 oe			M1 for finding *WLL* in any order
	$0.5^3 + 3 \times 0.3 \times 0.2^2$ or "$\frac{1}{8}$" + "$\frac{9}{250}$" or "0.125" + 3 × "0.012" oe			M1 for a complete method
		0.161		A1 oe
				Total 4 marks

15 **ALT**	0.3^3 or 0.027 or 0.2^3 or 0.008 oe		4	M1 for finding *WWW* or *LLL*
	$0.3^2 \times 0.5$ or 0.045 or $0.3^2 \times 0.2$ or 0.018 or $0.5^2 \times 0.3$ or 0.075 or $0.5^2 \times 0.2$ or 0.05 or $0.2^2 \times 0.5$ or 0.02 or $0.3 \times 0.5 \times 0.2$ or 0.03 **or** $0.3^2 \times 0.7$ or 0.063 or $0.5^2 \times 0.5$ or 0.125 or $0.2^2 \times 0.5$ or 0.02 or $0.3 \times 0.5 \times 0.2$ or 0.03			M1 for finding *WWD* or *WWL* or *WDD* or *DDL* or *DLL* or *WDL* in any order **or** for finding *WWW'* or *DDD'* or *DLL* or *WDL* in any order
	$1 – (3 \times 0.3^2 \times 0.5 + 3 \times 0.3^2 \times 0.2 + 3 \times 0.5^2 \times 0.3 + 3 \times 0.5^2 \times 0.2 + 3 \times 0.2^2 \times 0.5 + 6 \times 0.3 \times 0.5 \times 0.2)$ **or** $1 – (3 \times 0.3^2 \times 0.7 + 3 \times 0.5^2 \times 0.5 + 3 \times 0.2^2 \times 0.5 + 6 \times 0.3 \times 0.5 \times 0.2)$			M1 for a complete method
		0.161		A1 oe
				Total 4 marks

16	$\frac{12}{\sqrt{2}-1}\times\frac{\sqrt{2}+1}{\sqrt{2}+1}$ or $\frac{12}{\sqrt{2}-1}\times\frac{-\sqrt{2}-1}{-\sqrt{2}-1}$ **and** $4\sqrt{2}$ or $2\sqrt{8}$ or $\sqrt{32}$ oe		3	M1 for showing a correct method for rationalising the denominator **and** dealing with $\left(\sqrt{2}\right)^5$
	E.g. $12\sqrt{2}+12-4\sqrt{2}$ or $8\sqrt{2}+12$ $12\sqrt{2}+12-2\sqrt{8}$ or $12\sqrt{2}+12-\sqrt{32}$ oe			M1 dep expression must be in surd form
	E.g. $12\sqrt{2}(+12)-4\sqrt{2}=8\sqrt{2}(+12)=2\sqrt{4^2\times2}(+12)=2\sqrt{32}(+12)$ or $12\sqrt{2}(+12)-2\sqrt{8}=6\sqrt{8}(+12)-2\sqrt{8}=4\sqrt{8}(+12)=2\sqrt{4\times8}(+12)=2\sqrt{32}(+12)$ or $12\sqrt{2}(+12)-\sqrt{32}=3\sqrt{4^2\times2}(+12)-\sqrt{32}=2\sqrt{32}(+12)$ oe Note $8\sqrt{2}=2\sqrt{4^2\times2}$ or $2\sqrt{16\times2}$ or $\sqrt{32\times4}$ or $\sqrt{64\times2}$ $12\sqrt{2}=3\sqrt{4^2\times2}$ or $3\sqrt{16\times2}$ or $\sqrt{32\times9}$	Shown		A1 dep on M2 for showing working to given answer (they may dismiss the +12 and just deal with the surd part for this stage)
				Total 3 marks

17	$8t$ or $\pm 125t^{-2}$ oe		5	M1 for differentiating one term correctly
	$8t-125t^{-2}$ oe or $8t-\frac{125}{t^2}$ oe			A1 for both terms correct
	$8t-125t^{-2}=0$ **and** $(t=)\sqrt[3]{\frac{125}{8}}(=2.5)$			M1 for equating their $8t \pm at^{-2}$ oe or $bt \pm 125t^{-2}$ oe to zero **and** solving for t ie must have correct powers of t and at least one correct coefficient and correct isolation of t
	$4("2.5")^2+\frac{125}{"2.5"}$			M1 dep on previous M mark for substituting into s
		75		A1
				Total 5 marks

18	$(AC^2 =)\ 9.7^2 + 12.3^2 - 2 \times 9.7 \times 12.3 \times \cos 115$		5	M1 for the correct use of cosine rule
	$(AC^2 =)\ 346(.2\ldots)$ **or** $(AC =)\ \sqrt{346(.2....)}$ or 18.6…			A1 for 346 or $\sqrt{346(.2....)}$ or 18.6…
	$\frac{\sin x}{9.7} = \frac{\sin 115}{"\sqrt{346}"}$ oe or $9.7^2 = "\sqrt{346}"^2 + 12.3^2 - 2 \times "\sqrt{346}" \times 12.3 \times \cos x$ or $\frac{1}{2} \times 9.7 \times 12.3 \times \sin 115 = \frac{1}{2} \times 12.3 \times "\sqrt{346}" \times \sin x$ oe			M1 use of their *AC* dep on first M1 for correct use of sine rule **or** cosine rule **or** for setting up an equation using the area of a triangle formula to find sin *x*
	$\sin x = 9.7 \times \frac{\sin 115}{"\sqrt{346}"}$ oe or $\sin x = 0.47...$ or $\cos x = \frac{"\sqrt{346}"^2 + 12.3^2 - 9.7^2}{2 \times "\sqrt{346}" \times 12.3}$ or $\cos x = 0.88...$			M1 use of their *AC* dep on first M1 Allow $(x =)\sin^{-1}(....)$ or $(x =)\cos^{-1}(....)$
		28.2		A1 awrt
				Total 5 marks

19	$\pi\times(r+7)^2\times\frac{45}{360}$ oe or $(2\times)\pi\times(r-2)^2$ oe		5	M1
	$\pi\times(r+7)^2\times\frac{45}{360}=2\times\pi\times(r-2)^2$ oe			M1 for a correct equation
	E.g. $675r^2-3510r+675(=0)$ $15r^2-78r+15(=0)$ oe or $5r^2-26r+5(=0)$ oe Allow $5r^2-26r=-5$ or $[4(r-2)]^2=(r+7)^2$ or $(r-2)^2=\left[\frac{(r+7)}{4}\right]^2$			A1 (dep on M2) writing a correct quadratic expression in form $ax^2 + bx + c$ (= 0) allow $ax^2 + bx = c$
	$(5r-1)(r-5)(=0)$ oe or $(r=)\ \frac{--26\pm\sqrt{(-26)^2-4\times5\times5}}{2\times5}$ or $5\left(\left(r-\frac{26}{10}\right)^2-\left(\frac{26}{10}\right)^2\right)+5=0$ oe or $4r-8=r+7$ oe			M1 (dep on M1) for a complete method to solve their 3-term quadratic equation Allow one sign error and some simplification – allow as far as $\frac{26+\sqrt{676-100}}{10}$
		5		A1 dep on M2 (5 and $\frac{1}{5}$ scores M1M1A1M1A0)
				Total 5 marks

20	(i)		(s + 2, t)	1	B1oe accept (2 + s, t)
	(ii)		(s, 3t)	1	B1oe accept (s, 3 × t) or (s, t × 3)
					Total 2 marks

21	10 ÷ 20 (= 0.5) or a correct value on the FD scale and no errors or 25 small squares = 5 children or 5 small squares = 1 child oe or 1 small square = 0.2 children oe or 29 oe or 48 oe or 10 (associated with 75-80 bar)		3	M1
	(10 × 2.9) + (15 × 3.2) + (5 × 2) or 29 + 48 + 10 or (5.8 + 9.6 + 2) × 5 oe or (145 + 240 + 50) × 0.2 oe			M1for a fully correct method
		87		A1
				Total 3 marks

22	$580\pi = \pi \times 20 \times l$ oe		5	M1 for correct substitution into $A = \pi rl$
	$(l =)\dfrac{580\pi}{20\pi}(=29)$			M1
	$\sqrt{"29"^2 - 20^2}\ \ (=\sqrt{441} = 21)$			M1
	$\left(\dfrac{1}{2}\times\dfrac{4}{3}\times\pi\times 20^3\right)+\left(\dfrac{1}{3}\times\pi\times 20^2\times"21"\right)$ or $\dfrac{16\,000}{3}\pi+\dfrac{8400}{3}\pi$ or $\dfrac{16\,000}{3}\pi+2800\pi$			M1 for a complete method (Award M4 for 8133.3…….. if $\dfrac{24\,400}{3}$ is not seen)
		$\dfrac{24\,400}{3}$		A1 $8133.\dot{3}$ or $8133\dfrac{1}{3}$ (as exact form was requested) SC B4 for an answer of 25551(.62….) if no method shown
				Total 5 marks

23		$d = -2$		6	M1 for common difference
		$(S_n =)\frac{n}{2}\left[2(177)+(n-1)(-2)\right]$ or $(S_n =)\frac{n}{2}\left[354-2n+2\right]$ or $(S_n =)\frac{n}{2}\left[356-2n\right]$ oe			M1 for correctly substituting 177 and –2 into $(S_n =)\frac{n}{2}\left[2a+(n-1)d\right]$
		$\frac{n}{2}\left[2(177)+(n-1)(-2)\right]=(n-2)\times 180$			M1 dep on M2 for equating S_n with $(n-2)\times 180$
		E.g. $2n^2+4n-720=0$ or $n^2+2n-360=0$ oe Allow $n^2+2n=360$			A1 (dep on M3) writing a correct 3-term quadratic expression in form $ax^2 + bx + c$ (= 0) allow $ax^2 + bx = c$
		E.g. $(x-18)(x+20)(=0)$ $x = \frac{-2\pm\sqrt{2^2-4\times1\times-360}}{2}$ e.g. $(x+1)^2-(1)^2=360$			M1 (dep on M2) for a complete method to solve their 3-term quadratic equation Allow one sign error and some simplification – allow as far as $\frac{-2\pm\sqrt{4+1440}}{2}$
			18		A1 dep on M3 for 18 only
					Total 6 marks

23 ALT		3, 5, 7,… **and** $d = 2$ or $a = 3$ **and** $d = 2$		6	M1 for identifying exterior angle sequence for at least 3 terms and $d = 2$ **or** first term and common difference
		$(S_n =)\frac{n}{2}\left[2(3)+(n-1)(2)\right]$ or $(S_n =)\frac{n}{2}\left[6+2n-2\right]$ or $(S_n =)\frac{n}{2}\left[4+2n\right]$ oe			M1 for correctly substituting 3 and 2 into $(S_n =)\frac{n}{2}\left[2a+(n-1)d\right]$
		$\frac{n}{2}\left[2(3)+(n-1)(2)\right]=360$			M1 dep on M2 for equating S_n with 360
		E.g. $2n^2+4n-720=0$ or $n^2+2n-360=0$ oe Allow $n^2+2n=360$			A1 (dep on M3) writing a correct 3-term quadratic expression in form $ax^2 + bx + c$ (= 0) allow $ax^2 + bx = c$
		E.g. $(x-18)(x+20)(=0)$ $x = \frac{-2\pm\sqrt{2^2-4\times1\times-360}}{2}$ e.g. $(x+1)^2-(1)^2=360$			M1 (dep on M2) for a complete method to solve their 3-term quadratic equation Allow one sign error and some simplification – allow as far as $\frac{-2\pm\sqrt{4+1440}}{2}$
			18		A1 dep on M3 for 18 only
					Total 6 marks

24	$-q\left(x^2-\frac{12}{q}x\right)+q$ or $-q\left(x^2-\frac{12}{q}x-\frac{q}{q}\right)$ oe		4	M1 for a correct factorisation of the expression or $b = q$ (must be stated)
	$-q\left[\left(x-\frac{12}{2q}\right)^2 .....\right]$ oe or $-q\left[\left(x-\frac{6}{q}\right)^2 .....\right]$ oe			M1 for starting the correct process to complete the square
	E.g. $-q\left(x-\frac{6}{q}\right)^2+\frac{36}{q}+q$ oe or $-q\left(x-\frac{12}{2q}\right)^2+\frac{144q}{4q^2}+q$ oe			M1 for a complete process of completing the square. (Does not need to be simplified)
		$a=\frac{36}{q}+q$ $b=q$ $c=\frac{6}{q}$		A1 oe a and c must come from a correct process of completing the square. (Does not need to be simplified)
				Total 4 marks

24 **ALT**	$a - bx^2 + 2bcx - bc^2$ oe or $- bx^2 + 2bcx - bc^2 + a$ oe or $b = q$		4	M1 for correctly multiplying out $a - b(x - c)^2$
	$2bc = 12$ or $a - bc^2 = q$ oe			M1 for correctly equating coefficients
	$c = \frac{12}{2q}$ or $a = q\left(\frac{12}{2q}\right)^2 + q$ or $c = \frac{6}{q}$ or $a = q\left(\frac{6}{q}\right)^2 + q$			M1 for correctly finding a or c (Does not need to be simplified)
		$a = \frac{36}{q} + q$ $b = q$ $c = \frac{6}{q}$		A1 oe (Does not need to be simplified)
				Total 4 marks

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