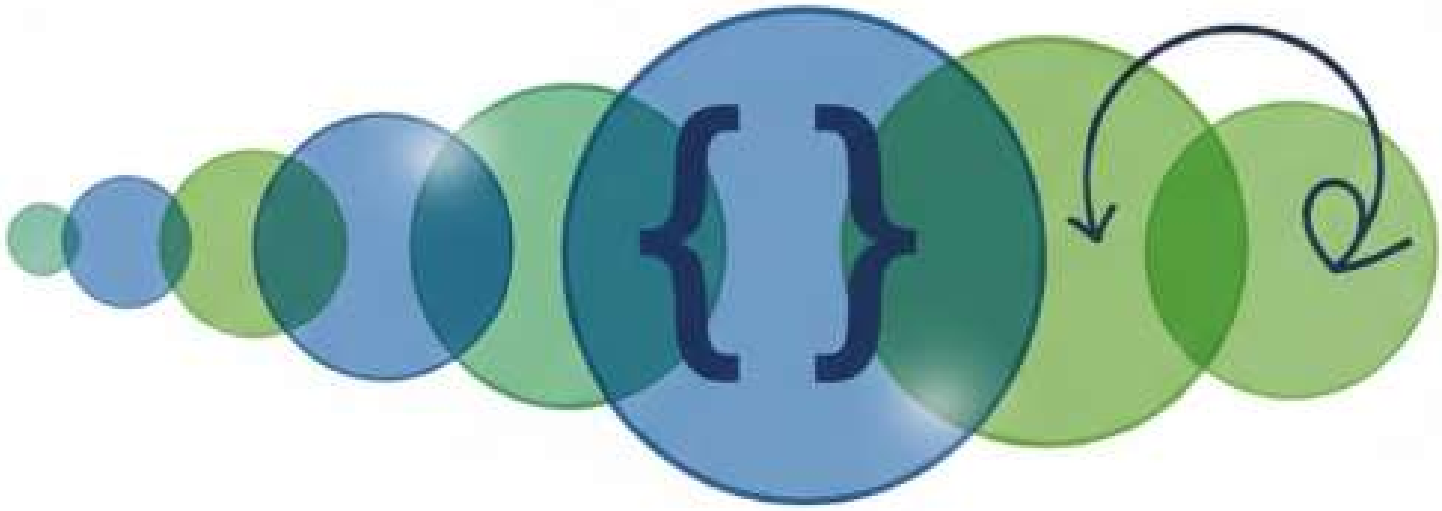
EDEXCEL IGCSE MATHEMATICS

PAPER 1H & 1HR (LINEAR)

SEQUENCES

QP & MS (2018 - 2025)



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EDEXCEL IGCSE MATHEMATICS MODULAR FOR MAY & OCT 2026

by Sir Muhammad Abdullah Shah

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1. June 2025 1H/Q24

An arithmetic series has 30 terms.

The first term is a
The common difference is d

The 20th term is 123
The sum of the 30 terms is 2880

Work out the value of a and the value of d
Show clear algebraic working.

$a =$ .....

$d =$ .....

(Total for Question 24 is 5 marks)

2. June 2025 1HR/Q24

The first 3 terms of an arithmetic series are

$$(2x + 5) \qquad (3y - 4) \qquad (4x - 2)$$

where x and y are constants.

The sum of the first 9 terms of the series is 216

Find the value of x and the value of y
Show clear algebraic working.

$x =$ .....

$y =$ .....

(Total for Question 24 is 6 marks)

3. Nov 2024 1H/Q19

An arithmetic series has first term a and common difference d

The sum of the first 30 terms of the arithmetic series is 4395

The sum of the 10th term and the 20th term is 284

Work out the sum of the first 45 terms of the arithmetic series.
Show clear algebraic working.

.....

(Total for Question 19 is 5 marks)

4. June 2024 1H/Q1

Here are the first four terms of an arithmetic sequence.

1 4 7 10

(a) Find an expression, in terms of n, for the nth term of this sequence.

.....

(2)

The nth term of a different arithmetic sequence is $5n + 17$

(b) Find the 12th term of this sequence.

.....

(1)

(Total for Question 1 is 3 marks)

5. June 2024 1H/Q24

A polygon has n sides, where $n > 5$

The interior angles of the polygon form an arithmetic sequence.

The smallest angle of the polygon is 84°
The common difference of the sequence is 4°

Work out the sum of the interior angles of the polygon.
Show clear algebraic working.

.....

(Total for Question 24 is 6 marks)

6. June 2024 1HR/Q23

Here are the first three terms of an arithmetic sequence.

$$(4x-14) \quad , \quad (x+2) \quad , \quad (7x-9)$$

Find, as an integer, the sum of the first 40 terms of the sequence.
Show clear algebraic working.

.....

(Total for Question 23 is 4 marks)

7. Nov 2023 1H/Q19

Here are the first 4 terms in an arithmetic sequence.

3 7 11 15

The last term of the sequence is x
The sum of the terms of the sequence is 7260

Find the value of x
Show clear algebraic working.

$x =$ .....

(Total for Question 19 is 6 marks)

8. June 2023 1H/Q20

The sum of the first 80 terms of an arithmetic series, S, is 470

The 75th term of S is 14.5

The sum of the first X terms of S is 171

Work out the value of X
Show your working clearly.

$X =$ .....

(Total for Question 20 is 6 marks)

9. Jan 2023 1H/Q22

The first term of an arithmetic series is $(2t + 1)$ where $t > 0$
The nth term of this arithmetic series is $(14t - 5)$

The common difference of the series is 3

The sum of the first n terms of the series can be written as $p(qt - 1)^r$ where p, q and r are integers.

Find the value of p, the value of q and the value of r
Show clear algebraic working.

$p =$ ..... $q =$ ..... $r =$ .....

(Total for Question 22 is 4 marks)

10. Jan 2023 1HR/Q24

An arithmetic sequence has first term 8 and common difference 11
The sequence has k terms, where $k > 21$

The sum of the last 20 terms of the sequence is 10 170

Find the value of k
Show clear algebraic working.

$k =$ .....

(Total for Question 24 is 5 marks)

11. June 2022 1H/Q1

Here are the first five terms of an arithmetic sequence.

1 5 9 13 17

(a) Find an expression, in terms of n, for the nth term of this sequence.

.....

(2)

The nth term of another arithmetic sequence is $3n + 5$

(b) Find an expression, in terms of m, for the $(2m)$th term of this sequence.

.....

(1)

(Total for Question 1 is 3 marks)

12. June 2022 1H/Q23

A polygon has n sides, where $n > 5$

When arranged in order of size, starting with the largest number, the sizes of the interior angles of the polygon, in degrees, are the terms of an arithmetic sequence.

Here are the first five terms of this sequence.

177 175 173 171 169

Find the value of n
Show clear algebraic working.

$n =$ .....

(Total for Question 23 is 6 marks)

13. June 2022 1HR/Q2

In a warehouse there are two types of shelves, type **R** and type **S**.

These two types of shelves are arranged into shelving units that form a sequence of patterns.

Here are the first three terms in the sequence.

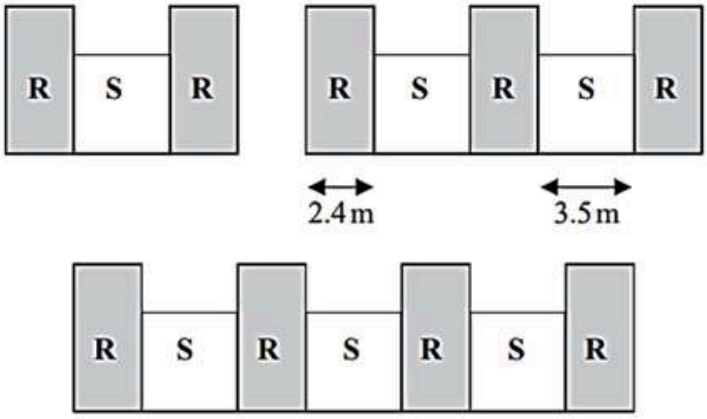

Diagram **NOT** accurately drawn

The width of each type **R** shelf is 2.4 m and the width of each type **S** shelf is 3.5 m

(a) Work out the total width of a shelving unit that has 6 type **R** shelves.

..... m

(2)

A shelving unit has n type **R** shelves.
The total width of this shelving unit is W metres.

(b) Find an expression for W in terms of n
Give your answer in its simplest form.

$W =$ .....

(2)

(Total for Question 2 is 4 marks)

14. Jan 2022 1HR/Q18

An arithmetic series has first term 1 and common difference 4

Find the sum of all terms of the series from the 41st term to the 100th term inclusive.

.....

(Total for Question 16 is 4 marks)

15. May 2021 1H/Q2

Here are the first 4 terms of an arithmetic sequence.

85 79 73 67

Find an expression, in terms of n, for the nth term of the sequence.

.....

(Total for Question 2 is 2 marks)

16. May 2021 1H/Q23

The sum of the first N terms of an arithmetic series, S, is 292
The 2nd term of S is 8.5
The 5th term of S is 13

Find the value of N.
Show clear algebraic working.

$N =$ .....

(Total for Question 23 is 5 marks)

17. Jan 2021 1H/Q24

An arithmetic series has first term a and common difference d.

The sum of the first $2n$ terms of the series is four times the sum of the first n terms of the series.

Find an expression for a in terms of d.
Show your working clearly.

$a =$ .....

(Total for Question 24 is 4 marks)

18. Jan 2021 1HR/Q21

The nth term of an arithmetic series is u_n where $u_n > 0$ for all n
The sum to n terms of the series is S_n

Given that $u_4 = 6$ and that $S_{11} = (u_6)^2 + 18$

find the value of u_{20}

.....

(Total for Question 21 is 6 marks)

19. Nov 2020 1H/Q24

Here are the first five terms of an arithmetic sequence.

8 15 22 29 36

Work out the sum of all the terms from the 50th term to the 100th term inclusive.

.....

(Total for Question 24 is 4 marks)

20. Nov 2020 1HR/Q18

In an arithmetic series, the 6th term is 39
In the same arithmetic series, the 19th term is 7.8

Work out the sum of the first 25 terms of the arithmetic series.

.....

(Total for Question 18 is 4 marks)

21. June 2019 1H/Q16

Here are the first five terms of an arithmetic sequence.

7 10 13 16 19

Find the sum of the first 100 terms of this sequence.

.....

(Total for Question 16 is 2 marks)

22. June 2019 1HR/Q19

The 25th term of an arithmetic series is 44.5
The sum of the first 30 terms of this arithmetic series is 765

Find the 16th term of the arithmetic series.
Show your working clearly.

.....

(Total for Question 19 is 5 marks)

23. Jan 2019 1H/Q21

$(2x + 23)$, $(8x + 2)$ and $(20x - 52)$ are three consecutive terms of an arithmetic sequence.

Prove that the common difference of the sequence is 12

(Total for Question 21 is 4 marks)

24. Jan 2019 1HR/Q12

Here are the first four terms of a sequence of fractions.

$$\frac{1}{1} \quad \frac{2}{3} \quad \frac{3}{5} \quad \frac{4}{7}$$

The numerators of the fractions form the sequence of whole numbers 1 2 3 4 ...
The denominators of the fractions form the sequence of odd numbers 1 3 5 7 ...

(a) Write down an expression, in terms of n, for the nth term of this sequence of fractions.

.....

(2)

(b) Using algebra, prove that when the square of any odd number is divided by 4 the remainder is 1

(3)

(Total for Question 12 is 5 marks)

25. June 2018 1HR/Q7

Here are the first four terms of an arithmetic sequence.

6 10 14 18

(a) Find an expression, in terms of n, for the nth term of this sequence.

.....

(2)

(b) Write down an expression, in terms of n, for the $(n + 1)$th term of this sequence.

.....

(1)

(Total for Question 7 is 3 marks)

26. June 2018 1HR/Q23

Work out the sum of the multiples of 3 between 1 and 1000

.....

(Total for Question 23 is 4 marks)

27. Sample 2018 1H/Q23

A, B and C are three towns.

The bearing of B from A is 105°
The bearing of C from B is 230°

The distance of C from A is 180 km.
The distance of C from B is 95 km.

Calculate the distance of B from A.
Give your answer correct to 3 significant figures.

..... km

(Total for Question 23 is 5 marks)

MARKING SCHEME

1. June 2025 1H/Q24

24	$123 = a + (20-1)d$ **or** $123 = a + 19d$			5	M1	for using $U_n = a+(n-1)d$
	$2880 = \frac{30}{2}(2a+(30-1)d)$ **or** $2880 = \frac{30}{2}(2a+29d)$ **or** $192 = 2a + 29d$				M1	for using $S_n = \frac{n}{2}(2a+(n-1)d)$
	eg $192 = 2a + 29d$ $123 = a + 19d$ (× 2) $246 = 2a + 38d$ Subtracting $54 = 9d$ **or** $192 = 2(123 - 19d) + 29d$ oe **or** $d = 6$	eg $192 = 2a + 29d$ (× 19) $123 = a + 19d$ (× 29) $3648 = 38a + 551d$ $3567 = 29a + 551d$ Subtracting $81 = 9a$ **or** $192 = 2a + 29\left(\frac{123-a}{19}\right)$ oe **or** $a = 9$			M1	(dep on M2) for a correct method to find a or d: coefficients of a or d the same in correct equations **and** correct operator to eliminate selected variable resulting in an equation in a only or in d only **or** writing a or d in terms of the other variable and correctly substituting (condone missing brackets)
	eg $192 = 2a + 29$("6") oe **or** $123 = a + 19$("6") oe	eg $192 = 2$("9") $+ 29d$ oe **or** $123 =$ "9" $+ 19d$ oe			M1	(dep on M3) for substituting their found value of a or d into a correct equation
	Working required		$a = 9$ $d = 6$		A1	dep on M2 a and d must be clearly identified
						Total 5 marks

2. June 2025 1HR/Q24

24	eg $(d=)(3y-4)-(2x+5)(=3y-2x-9)$ **or** $(2x+5)+d=3y-4$ oe **or** $(d=)(4x-2)-(3y-4)(=4x-3y+2)$ **or** $(3y-4)+d=(4x-2)$ **or** $(2d=)(4x-2)-(2x+5)(=2x-7)$ **or** $(2x+5)+2d=(4x-2)$ oe		6	M1	for a correct expression or equation using the common difference, may be in terms of d for this mark we will allow an expression for $-d$ or $-2d$
	eg $216=\frac{9}{2}[2(2x+5)+(9-1)d]$ **or** $216=\frac{9}{2}[2(2x+5)+(9-1)"(3y-2x-9)"]$ **or** $216=\frac{9}{2}[2(2x+5)+(9-1)"(4x-3y+2)"]$ **or** $216=\frac{9}{2}[2(2x+5)+(9-1)"(x-3.5)"]$ **or** $216=\frac{9}{2}[2(2("d+3.5")+5)+8d]$			M1	for a correct equation for the sum of 9 terms in x and d **or** in terms of x and y **or** in terms of x or in terms of d for "$3y-2x-9$ we will allow $(3y-4)-(2x+5)$ or for using their incorrect simplification from $(3y-4)-(2x+5)$ shown for "$4x-3y+2$we will allow $(4x-2)-(3y-4)$ or for using their incorrect simplification from $(4x-2)-(3y-4)$ shown similarly for their "$x-3.5$" and their "$d+3.5$"
	eg $6x-6y=-11$ oe **and** $12y-6x=55$ oe **or** $6x-6y=-11$ oe **and** $18x-12y=11$ oe **or** $2x-2d=7$ oe **and** $8d+4x=38$ **oe** eg $d=x-3.5$ oe **and** $48=12x-18$ oe **or** $x=d+3.5$ oe **and** $48=12d+24$ oe **or** $d=4.75-0.5x$ oe **and** $3x-2=14.5$ oe			M2	**left hand column** 2 correct equations in terms of x and y in the form $px + qy = r$ oe **or** 2 correct equations in terms of x and d in the form $px + qd = r$ oe **right hand column** 2 correct equations in terms of x and y where one is substituted into the other to get a correct equation in the form $px + q = r$ or $py + q = r$ **or** 2 correct equations in terms of x and d where one is substituted into the other to get a correct equation in the form $px + q = r$ or $pd + q = r$ **If not M2 then M1 for one correct equation in any of the required forms from the left hand or right hand column**
	one equation must be from the differences and one equation must be from the sum of the terms				
	Working required	$x=\frac{11}{2}$ $y=\frac{22}{3}$		A2	(dep on M2) oe (allow 7.3(33…)) (A1 for $x=\frac{11}{2}$ **or** $y=\frac{22}{3}$)
					Total 6 marks

3. Nov 2024 1H/Q19

19	$\frac{30}{2}[2a+(30-1)d]=4395$ or $30a+435d=4395$ or $2a+29d=293$			5	M1 for using $S_n=\frac{n}{2}[2a+(n-1)d]$
	$a+(10-1)d+a+(20-1)d=284$ or $a+9d+a+19d=284$ or $2a+28d=284$ or $a+14d=142$				M1 for using $U_n=a+(n-1)d$ correctly to form an equation
	eg $2a+29d=293$ $-\ 2a+28d=284$ $(d=9)$	eg $28a+406d=4102$ $-\ 29a+406d=4118$ $((-)a=(-)16)$			M1 dep on M2 for a correct method to eliminate a or d: coefficients of a or d the same **and** correct operator to eliminate selected variable (condone any one arithmetic error) **or** writing a or d in terms of the other variable and correctly substituting.
	$\frac{45}{2}[2(16)+(45-1)9]$				M1 dep on previous M1 for using $S_n=\frac{n}{2}[2a+(n-1)d]$ correctly with $a=16$ and $d=9$
	Working required		9630		A1 dep on M2
					Total 5 marks

4. Nov 2024 1H/Q19

1 (a)				2	M1 for $3n+k$ $(k\neq-2)$ or $3\times n+k$ $(k\neq-2)$ or $n\times 3+k$ $(k\neq-2)$ (k may be zero or absent)
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)		$3n-2$		A1 oe eg $1+(n-1)3$ oe or $3\times n-2$ oe or $n\times 3-2$ oe NB: award full marks for eg $x=3n-2$ oe or $x=3\times n-2$ oe or $x=n\times 3-2$ oe or nth term $=3n-2$ oe or nth term $=3\times n-2$ oe or nth term $=n\times 3-2$ oe or $3x-2$ Allow eg T_n or U_n or a_n for nth term **but** only M1 for $n=3n-2$ oe or $x=3x-2$
(b)			77	1	B1 cao
					Total 3 marks

5. June 2024 1H/Q24

24	$\frac{n}{2}[2(84)+(n-1)(4)]$ or $\frac{n}{2}[168+4n-4]$ or $\frac{n}{2}[164+4n]$ oe or $82n+2n^2$ oe		6	M1 for correctly substituting into $S_n=\frac{n}{2}[2a+(n-1)d]$
	$\frac{n}{2}[2(84)+(n-1)(4)]=(n-2)\times180$ or $\frac{n}{2}[164+4n]=(n-2)\times180$ oe or $82n+2n^2=(n-2)\times180$ oe			M1 for equating S_n with $(n-2)180$ S_n must come from correct substitution of a and d into $\frac{n}{2}[2a+(n-1)d]$
	eg $n^2-49n+180(=0)$ oe Allow $n^2-49n=-180$			M1dep on M2 for multiplying out and collecting terms, forming a three term quadratic in any form of an^2+bn+c (= 0) where at least 2 coefficients (a or b or c) are correct
	eg $(n-45)(n-4)(=0)$ $n=\frac{--49\pm\sqrt{(-49)^2-4\times1\times180}}{2}$ e.g. $\left(n-\frac{49}{2}\right)^2-\left(\frac{49}{2}\right)^2=-180$			M1ft dep on M2 method to solve **their** 3 term quadratic using any correct method (allow one sign error and some simplification – allow as far as eg $\frac{49\pm\sqrt{2401-720}}{2}$ **or** if factorising allow brackets which expanded give 2 out of 3 terms correct) **or** correct value for $n=45$ (ignore $n=4$)
	("45"$-2)\times180$ or $\frac{"45"}{2}[2(84)+("45"-1)(4)]$ oe or ("44"$-2)\times180$ or $\frac{"44"}{2}[2(84)+("44"-1)(4)]$ oe			M1 dep on previous M1 NB $n>5$
	Working required	7740		A1 dep on M5 Accept 7560 or 7480
				Total 6 marks

6. June 2024 1HR/Q23

23	$(7x-9)-(x+2)=(x+2)-(4x-14)$ oe eg $6x-11=16-3x$ **OR** $x+2=4x-14+d$ and $7x-9=4x-14+2d$ oe eg $-3x+16=d$ and $3x+5=2d$		4	M1 for setting up an equation in x **OR** two simultaneous equations in x and d
	$x=3$ **and** $a=-2$ **and** $d=7$ **OR** $x=3$ **and** eg $(S_{40}=)\frac{40}{2}[2(4x-14)+39(-3x+16)]$ **or** $x=3$ **and** eg $(S_{40}=)\frac{40}{2}[2(4x-14)+39(6x-11)]$			M1 correct values or values from correct substitution **OR** $x=3$ **and** S_{40} expressed in terms of x allow $(40-1)$ for 39
	$(S_{40}=)\frac{40}{2}(2\times"-2"+39\times"7")$ **or** eg $(S_{40}=)\frac{40}{2}[2(4\times"3"-14)+39(-3\times"3"+16)]$ **or** $(S_{40}=)\frac{40}{2}[2(4\times"3"-14)+39(6\times"3"-11)]$			M1 allow use of their a **and** their d **or** their x as long as clearly stated allow $(40-1)$ for 39
	Working required	5380		A1 (dep on M1)
				Total 4 marks

7. Nov 2023 1H/Q19

19	$a = 3$ and $d = 4$			6	M1 for a and d (can be embedded in the formula for S_n)
	$\frac{n}{2}[2(3)+(n-1)4]=7260$ or $\frac{n}{2}(2+4n)=7260$ oe	$\frac{n}{2}(3+x)=7260$ and $x=3+(n-1)4$			M1 Allow $n=x$
	eg $4n^2+2n=14520$ oe $2n^2+n-7260(=0)$ oe $8n^2+4n-29040(=0)$ oe	eg $x^2+4x-58077=0$ oe $x^2+4x=58077$			M1ft dep on previous M1 for forming a three term quadratic in any form of $ax^2+bx+c\ (=0)$ where at least 2 coefficients (a or b or c) are correct
	eg $(2n+121)(n-60)(=0)$ eg $(n=)\frac{-1\pm\sqrt{1^2-4\times2\times-7260}}{4}$ eg $2\left[\left(n+\frac{1}{4}\right)^2-\left(\frac{1}{4}\right)^2\right]=7260$	eg $(x-239)(x+243)(=0)$ eg $(x=)\frac{-4\pm\sqrt{4^2-4\times1\times-58077}}{2}$ eg $(x+2)^2-(2)^2=58077$			M1ft dep on previous M1 for a method to solve **their** 3 term quadratic using any correct method Allow one sign error and some simplification – allow as far as eg $\frac{-1\pm\sqrt{1+58080}}{4}$ or $\frac{-4\pm\sqrt{16+232308}}{2}$
	$(n=)\ 60$ (and $(n=)\ -60.5$)	$(x=)\ 239$ (and $(x=)\ -243$)			A1 dep on M3 Ignore negative values
	Working required		239		A1 cao dep on M3 SCB2 if not shown clear algebraic working but give an answer of 239 (with method shown involving $a = 3$ and $d = 4$) as question asks for algebraic working. 239 alone gains zero marks
					Total 6 marks

8. June 2023 1H/Q20

20	$\frac{80}{2}(2a+79d)=470$ oe		6	M1	for substituting into the sum of arithmetic series formula
	$a+74d=14.5$ oe			M1	for substituting into the nth term of arithmetic sequence formula
	correct method to find the value of a or d eg $2a+148d=29$ $2a+79d=11.75$			M1	solve the correct equations simultaneously, eg make the coefficients of a or d the same and show the intention to subtract **or** rearrange one equation to make a or d the subject and substitute into the other equation
	correct values of $a=-4$ and $d=0.25$ oe			A1	dep on M2
	$\frac{X}{2}(2\times"-4"+(X-1)"0.25")=171$ oe			M1	correctly substituting the found values of a and d into a correct equation, can be their values of a and d as long as clearly stated
	Working required	57		A1	dep on M2
					Total 6 marks

9. Jan 2023 1H/Q22

22	$2t+1+(n-1)3=14t-5$		4	M1 for the use of nth term $= a + (n-1)d$ to find n
	$(n=)\ 4t-1$ or $(n=)\ -1+4t$			A1
	$(S_n=)\frac{"4t-1"}{2}[2(2t+1)+("4t-1"-1)3]$ or $(S_n=)\frac{"4t-1"}{2}[2t+1+14t-5]$ oe			M1 for the use of S_n formula (must be in terms of t) Allow their expression for n dep on M1
	Working required	$p=2$ $q=4$ $r=2$		A1 dep on M2 allow $(S_n=)\ 2(4t-1)^2$ Values of p, q and r must come from correct working
				Total 4 marks

10. Jan 2023 1HR/Q24

24	$(S_{20}=)10[2A+19\times11]=10170$ oe (where A is the $u_{(k-19)}$ th term)		5	M1	
	$A=\left(\frac{10170}{10}-19\times11\right)\div2(=404)$			M1	
	$8+(P-1)11="404"$ oe (where P is the number of terms from 20 to the end)			M1	M2 for $8+11\times(k-20)="404"$
	$P=\frac{"404"-8+11}{11}(=37)$			M1	
	Working required	56		A1	dep on M1
	ALTERNATIVE METHOD				
	$(S_k=)\frac{k}{2}[2\times8+(k-1)11]$ **or** $(S_{k-20}=)\frac{(k-20)}{2}[2\times8+(k-21)11]$ **or** $(u_{k-19}=)8+11(k-20)$ **or** $(u_k=)8+11(k-1)$ *(allow use of letter other than k)*		5	M1	for S_k **or** S_{k-20} **or** u_k or u_{k-19} ***a* and *d* must be substituted correctly**
	$(S_k=)\frac{k}{2}[2\times8+(k-1)11]$ **and** $(S_{k-20}=)\frac{(k-20)}{2}[2\times8+(k-21)11]$ **or** $(u_{k-19}=)8+11(k-20)$ **and** $(u_k=)8+11(k-1)$			M1	For correct expressions for both S_k and S_{k-20} **or** u_k and u_{k-19}
	$10170=\frac{k}{2}["16"+(k-1)11]-\frac{(k-20)}{2}["16"+(k-21)11]$ oe **or** $10170=\frac{20}{2}([8+11(k-20)+[8+11(k-1)])$ oe			M1	
	eg $10170=160+\frac{11}{2}[40k-420]$ oe eg $440k=24640$ or $2240=40k$ oe			M1	Expanding to obtain a linear equation **and** collecting terms in k
	Working required	56		A1	dep on M1
					Total 5 marks

11. June 2022 1H/Q1

1	(a)			2	M1 for $4n+k$ $(k\neq-3)$ or $4\times n+k$ $(k\neq-3)$ or $n\times4+k$ $(k\neq-3)$ (k may be zero or absent)
			$4n-3$		A1 oe e.g. $1+(n-1)4$ oe or $4\times n-3$ oe or $n\times4-3$ oe NB: award full marks for eg $x=4n-3$ oe or $x=4\times n-3$ oe or $x=n\times4-3$ oe or nth term $=4n-3$ oe or nth term $=4\times n-3$ oe or nth term $=n\times4-3$ oe but only M1 for $n=4n-3$ oe
	(b)		$6m+5$	1	B1 for $3(2m)+5$ oe or $6m+5$ or $3\times2m+5$ oe or $6\times m+5$ Allow $3(2n)+5$ or $6n+5$ oe
					Total 3 marks

12. June 2022 1H/Q23

23		$d=-2$		6	M1 for common difference
		$(S_n=)\frac{n}{2}[2(177)+(n-1)(-2)]$ or $(S_n=)\frac{n}{2}[354-2n+2]$ or $(S_n=)\frac{n}{2}[356-2n]$ oe			M1 for correctly substituting 177 and –2 into $(S_n=)\frac{n}{2}[2a+(n-1)d]$
		$\frac{n}{2}[2(177)+(n-1)(-2)]=(n-2)\times180$			M1 dep on M2 for equating S_n with $(n-2)\times180$
		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

13. June 2022 1HR/Q2

2	(a)	eg $6\times2.4+5\times3.5$		2	M1	
			31.9		A1	oe
	(b)	$(W=)\ 5.9n$ **or** $(W=)\ 5.9(n-1)+2.4$ **or** $(W=)\ 2.4n+3.5(n-1)$		2	M1	for $2.4n+3.5n$ or $5.9n$ seen
			$5.9n-3.5$		A1	oe but must be in simplest form eg $-3.5+5.9n$
						Total 4 marks

14. Jan 2022 1HR/Q16

16	$\frac{100}{2}[2\times1+(100-1)\times4](=19\,900)$ oe or $1+(41-1)\times4\ (=161)$ oe or $1+(100-1)\times4\ (=397)$ oe		4	M1 for method to find the sum of the first 100 terms or for finding the 41st term or for finding the 100th term
	$\frac{40}{2}(2\times1+(40-1)\times4)(=3160)$ oe or $\frac{41}{2}(2\times1+(41-1)\times4)(=3321)$ oe or $100-41+1\ (=60)$ oe			M1 for method to find the sum of the first 40 terms or 41 terms or for finding the number of terms from the 41st term to the 100th term
	"19 900" – "3160" or $\frac{"60"}{2}["161"+"397"]$ or $\frac{"60"}{2}[2\times"161"+("60"-1)\times4]$ oe			M1 for finding the difference or for finding the sum from the 41st term to the 100th term
		16 740		A1
				Total 4 marks

15. May 2021 1H/Q2

2			$91-6n$	2	B2	For a correct answer in any form eg $91-6\times n$ **or** $-6n+91$ **or** $85+(n-1)(-6)$ oe (B1 for $-6n+k$ oe (k may be zero or absent)) NB: award full marks for eg $x=91-6n$ **or** nth term $=91-6n$ but only B1 for $n=91-6n$
						Total 2 marks

16. May 2021 1H/Q23

23		$a+d=8.5$, $a+4d=13$ oe		5	M1	for at least 1 correct equation **or** for $d=1.5$
		$a=7$, $d=1.5$			A1	both values correct
		$\frac{N}{2}(2\times7+(N-1)1.5)=292$ (eg $3N^2+25N-1168$ [= 0] **or** $1.5N^2+12.5N-584$ [= 0])			M1	A correct equation for the total of the first N terms of the series with a and d substituted in. The mark can be gained by using **their** values of a and d even if no previous marks awarded.
		eg $(3N+73)(N-16)$ [=0] $[N=]\ \frac{-25\pm\sqrt{25^2-4\times3\times-1168}}{2\times3}$			M1	A correct method dep on the previous M1 for solving **their** 3 term quadratic equation using any correct method (allow one sign error and some simplification – allow as far as $\frac{-25\pm\sqrt{625+14016}}{6}$) oe (may be ± or just +) or if factorising, allow brackets which expanded give 2 out of 3 terms correct, or if completing the square allow as far as the stage $3((N+\frac{25}{6})^2-\frac{25^2}{6^2})-1168\ (=0)$
		Working required	16		A1	dep on M2
						Total 5 marks

17. Jan 2021 1H/Q24

24	$\frac{2n}{2}[2a+(2n-1)d]$ oe		4	M1	for a correct expression for S_{2n}
	$\frac{2n}{2}[2a+(2n-1)d]=4\times\frac{n}{2}[2a+(n-1)d]$ oe			M1	dep on M1 for setting up a correct equation for $S_{2n}=4\times S_n$
	$2a-d=4a-2d$ oe			M1	for a correct linear expression in a and d
		$\frac{d}{2}$		A1	(dep on M2) for $\frac{d}{2}$ oe
					Total 4 marks

18. Jan 2021 1HR/Q21

21	E.g. $a+3d=6$ oe		6	M1	for forming an equation for the 4th term of the sequence
	E.g. $\frac{11}{2}(2a+10d)=(a+5d)^2+18$			M1	for forming an equation for the sum of the first 11 terms of the sequence
	E.g. $a=6-3d$ **and** $\frac{11}{2}[2(6-3d)+10d]=(6-3d+5d)^2+18$ or $d=\frac{6-a}{3}$ **and** $\frac{11}{2}\left[2a+10\left(\frac{6-a}{3}\right)\right]=\left(a+5\left(\frac{6-a}{3}\right)\right)^2+18$			M1	dep on M2 for a correct first step to solve the two equations (writing the equation in terms of one variable) **Note:** If $\frac{11}{2}(2a+10d)=(a+5d)^2+18$ is expanded then this must be a correct expansion E.g. $11a+55d=a^2+10ad+25d^2+18$
	E.g. $2d^2+d-6(=0)$ oe **or** $2a^2-27a+36(=0)$ oe			A1	for a correct 3 term quadratic equation
	$d=1.5$ oe **and** $a=1.5$ oe			A1	for a correct value of d **and** a
		30		A1	cao
					Total 6 marks

19. Nov 2020 1H/Q24

24	$a = 8$ $d = 7$			4	M1	can be implied
	$(S_{100} =) \frac{100}{2}(2\times8+(100-1)\times7)$ (= 35 450) **or** $(S_{49} =) \frac{49}{2}(2\times8+(49-1)\times7)$ (= 8624) **or** $(S_{50} =) \frac{50}{2}(2\times8+(50-1)\times7)$ (= 8975)				M1	
	'35450' – '8624' **or** '35450' – '8975' + (8 + (50 – 1)×7)				M1	
			26 826		A1	
						Total 4 marks
	Alternative scheme					
	$(u_n =)$ 7n + 1	$a = 8$ and $d = 7$		4	M1	can be implied
	$(u_{50} =)$ 7 × 50 + 1 (= 351) **or** $(u_{100} =)$ 7 × 100 + 1 (= 701)	$(u_{50} =)$ 8 + (50 – 1)×7 (= 351)			M1	
	$\frac{51}{2}$('351'+'701')	$\frac{51}{2}(2\times351+(51-1)\times7)$			M1	
			26 826		A1	
						Total 4 marks

20. Nov 2020 1HR/Q18

18	$a + 5d = 39$ **or** $a + 18d = 7.8$ **or** $13d = -31.2$ oe		4	M1	
	$a = 51$ **or** $d = -2.4$			A1	
	e.g. $\frac{25}{2}(2\times51+(25-1)\times-2.4)$ oe **or** $12.5(2a + 23d + d) = 12.5(39 + 7.8 – 2.4)$ oe			M1	for substituting their values for a and d into S_n, a and d must be clearly stated.
		555		A1	
					Total 4 marks

21. June 2019 1H/Q16

16		$a = 7$ and $d = 3$ $\frac{100}{2}(2\times7+(100-1)\times3)$ **or** 100th term is 7 + (100 – 1) × 3 (= 304) **and** 100 × (7 + "304") ÷ 2 **or** 100^{th} term is 3 × 100 + 4 (= 304) **and** 100 × (7 + "304") ÷ 2		2	M1	for a method to find the sum - brackets (100 – 1) must be used correctly
			15 550		A1	
						Total 2 marks

22. June 2019 1HR/Q19

19	$a + 24d = 44.5$		5	M1	oe
	$\frac{30}{2}(2a+(30-1)d) = 765$ oe, eg (15(2a + 29d) = 765), (2a + 29d = 51), etc			M1	oe (may be simplified)
	e.g. 2(44.5 – 24d) + 29d = 51 oe or _2a + 48d = 89 2a + 29d = 51 oe			M1	dep on M2, a complete method to eliminate one variable, allow one arithmetic error
		26.5		A2 (A1)	dep on M2, oe dep on M2. If not A2, award A1 for $a = -3.5$ **or** $d = 2$
					Total 5 marks

23. Jan 2019 1H/Q21

Question	Working	Answer	Mark	Notes
	Mark scheme 1 (see next page for alternative mark scheme)			
21	$(8x + 2) - (2x + 23)$ $(= 6x - 21)$ **or** $(2x + 23) - (8x + 2)$ $(= -6x + 21)$ **or** $(20x - 52) - (8x + 2)$ $(= 12x - 54)$ **or** $(8x + 2) - (20x - 52)$ $(= -12x + 54)$			M1 for a correct expression for the common difference in terms of x brackets must be present or removed correctly
	$(8x + 2) - (2x + 23) = (20x - 52) - (8x + 2)$ oe **or** $(2x + 23) - (8x + 2) = (8x + 2) - (20x - 52)$ oe			M1 for a correct equation
	$x = 5.5$			A1
	Eg $2 \times 5.5 + 23$ (=34) **and** $8 \times 5.5 + 2$ (=46) **OR** $8 \times 5.5 + 2$ (=46) **and** $20 \times 5.5 - 52$ (=58)	shown	4	A1 for 12 from correct working

24. Jan 2019 1HR/Q12

12	(a)		$\frac{n}{2n-1}$	2	M1	for $2n \pm k$ oe as the denominator
					A1	oe
	(b)	$(2n-1)^2 = 4n^2 - 4n + 1$	Proved	3	M1	or $(2n+1)^2 = 4n^2 + 4n + 1$ ft on $2n \pm k$ (k non zero)
		$4(n^2 - n) + 1$ **or** $\frac{4n^2 - 4n + 1}{4} = n^2 - n + \frac{1}{4}$			M1	or $4(n^2 + n) + 1$ **or** $\frac{4n^2 + 4n + 1}{4} = n^2 + n + \frac{1}{4}$
					A1	Conclusion

25. June 2018 1HR/Q7

7	(a)		$4n + 2$	2	M1	for $4n + k$ (k may be 0 or absent) oe
					A1	oe e.g $6 + (n - 1)4$
	(b)		$4n + 6$	1	B1	oe ft part (a) providing M1 in part (a) is awarded e.g $4(n + 1) + 2$
						Total 3 marks

26. June 2018 1HR/Q23

23	(First term = 3 and last term = 999) or $a = 3$ and $d = 3$	166 833	4	M1	
	$999 \div 3$ (= 333)			M1	for finding the number of terms Allow $1000 \div 3 = 333.3 = 333$
	Sum $= \frac{333}{2}(3 + 999)$ or Sum $= \frac{333}{2}(2 \times 3 + (333 - 1)3)$			M1	for using a correct method to find the sum
				A1	
					Total 4 marks

27. Sample 2018 1H/Q23

23	eg. diagram drawn showing relative positions of A, B and C can be implied by angle $ABC = 55°$			M1	interprets information
	$\frac{\sin CAB}{95} = \frac{\sin 55}{180}$			M1	
	$CAB = \sin^{-1}\left(\frac{95 \sin 55}{180}\right)$ **or** $CAB = 25.6(1\ldots)$			M1	dep
	$AB = \frac{180}{\sin 55} \times \sin(180 - 55 - "25.6")$			M1	dep or for $\sqrt{180^2 + 95^2 - 2 \times 180 \times 95 \times \cos(180 - 55 - "25.6"}$
		217	5	A1	
					Total 5 marks