

SEQUENCES

Page	Description
1	Write and complete sequences by adding or taking a number
2	Introduce the n th term rule for sequences
3	Term to term rule and the n th term rule
4	Recap on linear sequences
5	Special sequences. Squares, cubes, triangular numbers, Fibonacci and Geometric sequences
6	Introduction to quadratic sequences
7	Find the n th term of a quadratic sequence

Sequences

Write down the first FIVE numbers in each of these sequences.

- 1) The sequence starts with 7. The rule is add 2.

7, 9, 11, 13, 15

- 2) The sequence starts with 8. The rule is add 6.

8, 14, 20, 26, 32

- 3) The sequence starts with 3. The rule is add 7.

3, 10, 17, 24, 31

- 4) The sequence starts with 20. The rule is take 3.

20, 17, 14, 11, 8

- 5) The sequence starts with 15. The rule is take 4.

15, 11, 7, 3, -1

Write down the next two terms of these sequences and their rule.

- 6) 8, 12, 16, 20. 24, 28 The rule is + 4

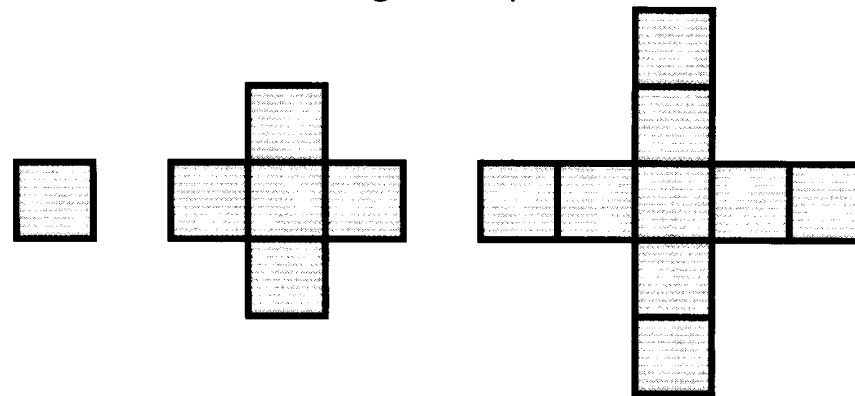
- 7) 5, 12, 19, 26. 33, 40 The rule is + 7

- 8) 2.5, 3.5, 4.5, 5.5. 6.5, 7.5 The rule is + 1

- 9) 21, 19, 17, 15. 13, 11 The rule is - 2

- 10) 24, 17, 10, 3. -4, -11 The rule is - 7

Use these drawings for questions 11 to 14



- 11) Write down the sequence from the drawings. 1, 5, 9, 13, 17

- 12) What is the rule for the sequence? + 4

- 13) What is the tenth number in this sequence? ³⁷
1, 5, 9, 13, 17, 21, 25, 29, 33, 37

- 14) The number 25 is in the sequence. Which term is it? 7th

Use these drawings for questions 15 to 18



- 15) Write down the sequence from the drawings. 1, 3, 5, 7, 9

- 16) What is the rule for the sequence? + 2

- 17) What is the tenth number in this sequence? 19

- 18) The number 17 is in the sequence. Which term is it? 9th

①

1, 3, 5, 7, 9, 11, 13, 15, 17, 19

Sequences

Qu. 1 n^{th} term rule $3n + 1$ $3 \times \text{the position} + 1$

position	1st term	2nd term	3rd term	4th term	5th term	10th term
	$n = 1$	$n = 2$	$n = 3$	$n = 4$	$n = 5$	$n = 10$
term	$3 \times 1 + 1$	$3 \times 2 + 1$	$3 \times 3 + 1$	$3 \times 4 + 1$	$3 \times 5 + 1$	$3 \times 10 + 1$
	4	7	10	13	16	31

term to term rule $+3$

Qu. 2 n^{th} term rule $4n - 1$ $4 \times \text{the position} - 1$

position	1st term	2nd term	3rd term	4th term	5th term	10th term
	$n = 1$	$n = 2$	$n = 3$	$n = 4$	$n = 5$	$n = 10$
term	$4 \times 1 - 1$	$4 \times 2 - 1$	$4 \times 3 - 1$	$4 \times 4 - 1$	$4 \times 5 - 1$	$4 \times 10 - 1$
	3	7	11	15	19	39

term to term rule $+4$

Qu. 3 n^{th} term rule $2n + 3$ $2 \times \text{the position} + 3$

position	1st term	2nd term	3rd term	4th term	5th term	10th term
	$n = 1$	$n = 2$	$n = 3$	$n = 4$	$n = 5$	$n = 10$
term	$2 \times 1 + 3$	$2 \times 2 + 3$	$2 \times 3 + 3$	$2 \times 4 + 3$	$2 \times 5 + 3$	$2 \times 10 + 3$
	5	7	9	11	13	23

term to term rule $+2$

Qu. 4 n^{th} term rule $5n - 2$ $5 \times \text{the position} - 2$

position	1st term	2nd term	3rd term	4th term	5th term	10th term
	$n = 1$	$n = 2$	$n = 3$	$n = 4$	$n = 5$	$n = 10$
term	$5 \times 1 - 2$	$5 \times 2 - 2$	$5 \times 3 - 2$	$5 \times 4 - 2$	$5 \times 5 - 2$	$5 \times 10 - 2$
	3	8	13	18	23	48

term to term rule $+5$

Qu. 5 n^{th} term rule $4n + 3$ $4 \times \text{the position} + 3$

position	1st term	2nd term	3rd term	4th term	5th term	10th term
	$n = 1$	$n = 2$	$n = 3$	$n = 4$	$n = 5$	$n = 10$
term	$4 \times 1 + 3$	$4 \times 2 + 3$	$4 \times 3 + 3$	$4 \times 4 + 3$	$4 \times 5 + 3$	$4 \times 10 + 3$
	7	11	15	19	23	43

term to term rule $+4$

Qu. 6 n^{th} term rule $24 - 2n$ $24 - 2 \times \text{the position}$

Remember !!
Times before take

position	1st term	2nd term	3rd term	4th term	5th term	10th term
	$n = 1$	$n = 2$	$n = 3$	$n = 4$	$n = 5$	$n = 10$
term	$24 - 2 \times 1$	$24 - 2 \times 2$	$24 - 2 \times 3$	$24 - 2 \times 4$	$24 - 2 \times 5$	$24 - 2 \times 10$
	$24 - 2$	$24 - 4$	$24 - 6$	$24 - 8$	$24 - 10$	$24 - 20$
	22	20	18	16	14	4

term to term rule -2

(2)

1 $\overleftarrow{-1}$ 4, 9, 14, 19,

The term to term rule is $+5$

The nth term rule is $5n - 1$

The 20th term is 99

$$\begin{aligned} 5 \times 20 - 1 \\ 100 - 1 = 99 \end{aligned}$$

4 $\overleftarrow{3}$ 7, 11, 15, 19,

The term to term rule is $+4$

The nth term rule is $4n + 3$

The 20th term is

$$\begin{aligned} 4 \times 20 + 3 \\ = 80 + 3 \\ = 83 \end{aligned}$$

2 $\overleftarrow{24}$ 20, 16, 12, 8,

The term to term rule is -4

The nth term rule is $-4n + 24$

The 20th term is

$$\begin{aligned} -4 \times 20 + 24 \\ -80 + 24 \\ = -56 \end{aligned}$$

5 The rule for a sequence is $4n + 3$.

Write down the first five terms of the sequence.

7, 11, 15, 19, 23

What is the 20th term of this sequence?

$$4 \times 20 + 3 = 83$$

Is 64 in this sequence?

No, all odd numbers

$$\text{OR } 4n + 3 = 64$$

$$4n = 61$$

$$n = \frac{61}{4} = 15.25$$

Not a whole number

3 The rule for a sequence is $2n - 3$.

Write down the first five terms of the sequence.

-1, 1, 3, 5, 7

What is the 20th term of this sequence?

$$\begin{aligned} 2 \times 20 - 3 \\ 40 - 3 = 37 \end{aligned}$$

Is 64 in this sequence?

No, all terms are odd

$$\text{OR } 2n - 3 = 64 \quad 2n = 67 \quad n = \frac{67 - 33.5}{2}$$

6 The rule for a sequence is $24 - 2n$.

not a whole number

Write down the first five terms of the sequence.

22, 20, 18, 16, 14

What is the 20th term of this sequence?

$$24 - 2 \times 20 = 24 - 80 = -56$$

Is -64 in this sequence?

$$-64 = 24 - 2n$$

$$2n - 64 = 24$$

$$2n = 88$$

$$n = \frac{88}{2} = 44$$

Yes, the 44th term

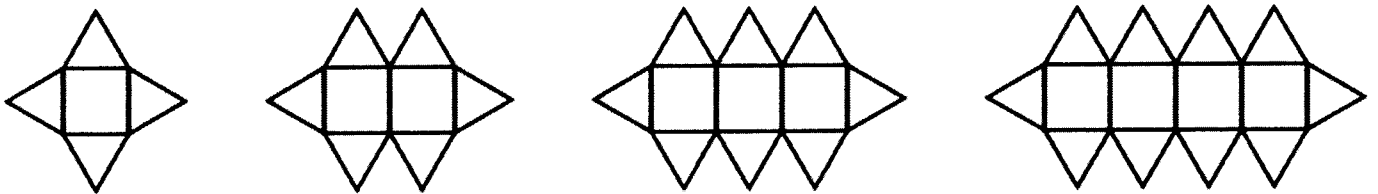
Sequences

Write down the first FIVE terms and the 10th for each of these sequences.

- 1) $4n + 3$ 7, 11, 15, 19, 23 43
- 2) $2n + 7$ 9, 11, 13, 15, 17 27
- 3) $10 - n$ 9, 8, 7, 6, 5 -5
- 4) $24 - 2n$ 22, 20, 18, 16, 14 4
- 5) $3n - 2$ 1, 4, 7, 10, 13 28

Write down the "by position" or nth term rule for these sequences.

- 6) 3, 5, 7, 9, 11 + 2 $2n + 1$
- 7) 6, 10, 14, 18, 22 + 4 $4n + 2$
- 8) 2, 5, 8, 11, 14 + 3 $3n - 1$
- 9) 21, 19, 17, 15, 13 - 2 $-2n + 23$
- 10) 30, 27, 24, 21, 18 - 3 $-3n + 33$
- 11)



Pattern number (n)	1	2	3	4	5	6
Squares	1	2	3	4	5	6
Triangles	4	6	8	10	12	14

Find the rule for the rule for the number of triangles given the pattern number (n) $2n + 2$

How many triangles in the 20th drawing? $2 \times 20 + 2 = 42$

12) Here are the first five terms of a sequence.

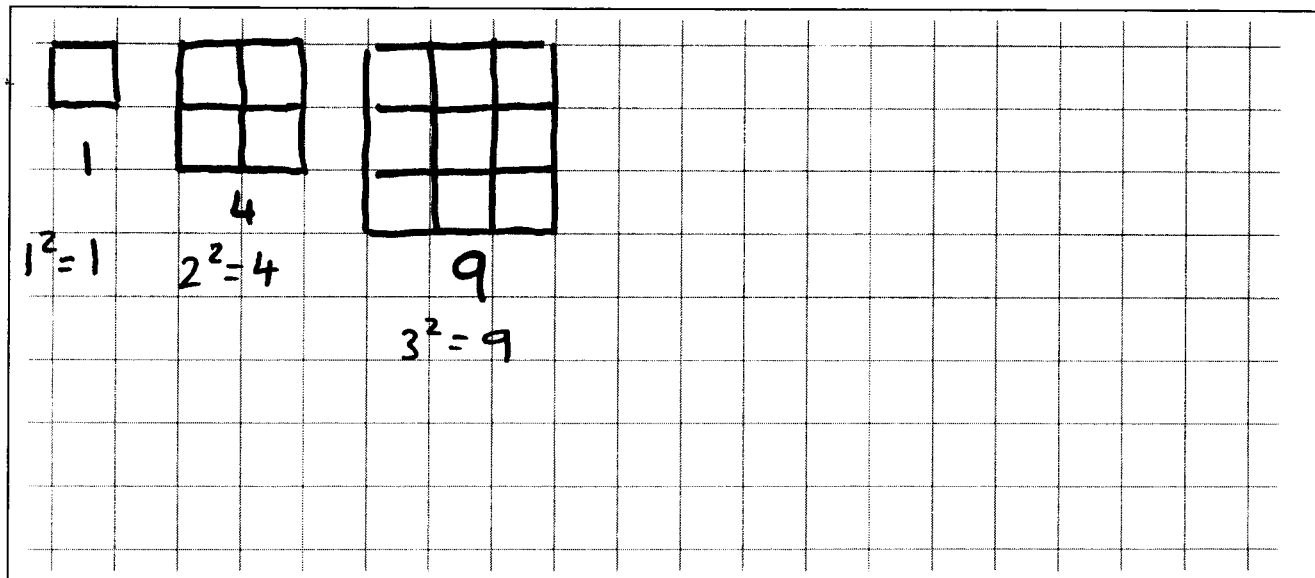
8 11 14 17 20 rule $3n + 5$

Work out the 11th term of the sequence. Explain how you worked out your answer.

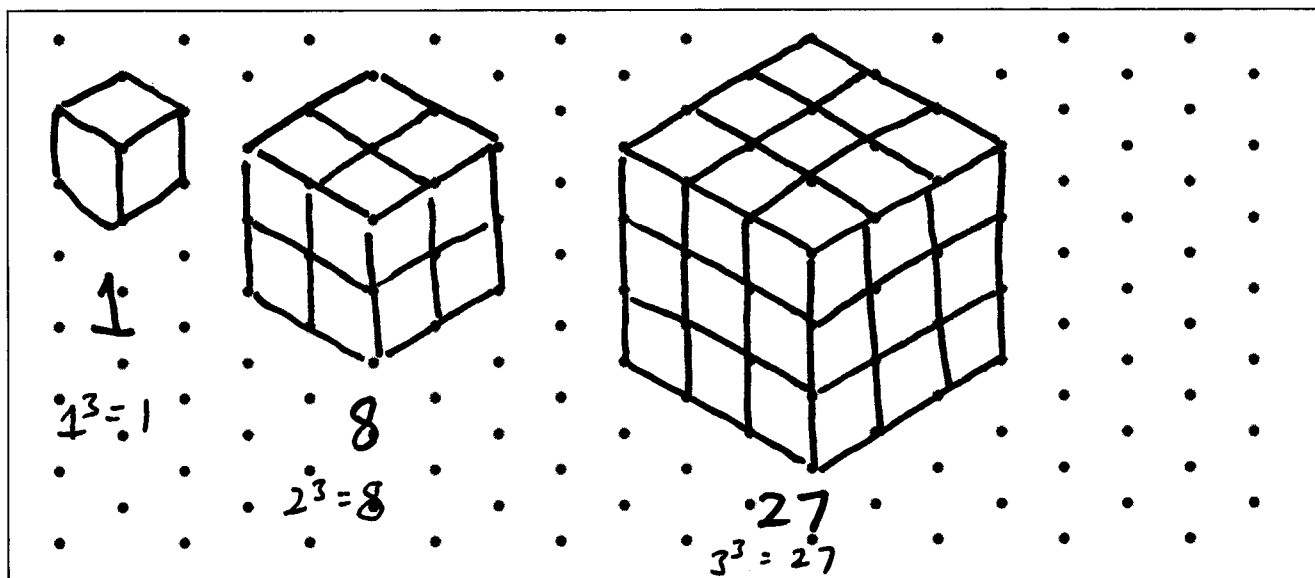
11th term $3 \times 11 + 5$
 $33 + 5 = 38$
4

Complete the sequences

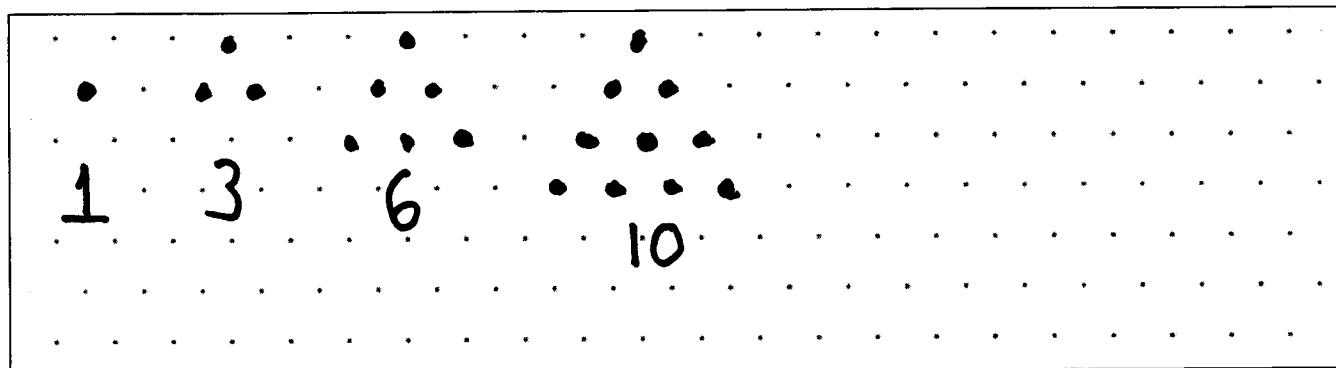
SQUARE NUMBERS 1, 4, 9, 16, 25, 36, 49, 64, 81



CUBE NUMBERS 1, 8, 27, 64, 125, 216, 343, 512, 729, 1000



TRIANGULAR NUMBERS 1, 3, 6, 10, 15, 21, 28, 36, 45, 55



Fibonacci Add the last two terms to make the next one. For example 1, 1, 2, 3, 5, 8, 13, 21, 34, 55

Geometric Sequence One term is multiplied by a fixed number to make the next term. E.g. 1, 2, 4, 8, 16, 32, 64

Write down the first FIVE terms for these Quadratic Sequences

	$n^2 + 2n + 1$	$2n^2 - 3$	$n^2 - 3n + 4$
$n=1$	$1^2 + 2 \times 1 + 1 = 4$	-1	2
$n=2$	$2^2 + 2 \times 2 + 1 = 4 + 4 + 1 = 9$	5	2
$n=3$	$3^2 + 2 \times 3 + 1 = 9 + 6 + 1 = 16$	15	4
$n=4$	$4^2 + 2 \times 4 + 1 = 16 + 8 + 1 = 25$	29	8
$n=5$	$5^2 + 2 \times 5 + 1 = 25 + 10 + 1 = 36$	47	14

Find the nth term rule for this quadratic sequence 2, 6, 12, 20, 30

n	term	1 st difference	2 nd difference	$1n^2$	term - $1n^2$
1	2	4	(2) $\xrightarrow{\div 2}$	$1^2 = 1$	$2 - 1 = 1$
2	6	6	2	$2^2 = 4$	$6 - 4 = 2$
3	12	8	2	$3^2 = 9$	$12 - 9 = 3$
4	20	10		$4^2 = 16$	$20 - 16 = 4$
5	30			$5^2 = 25$	$30 - 25 = 5$

↑
rule for the sequence
1, 2, 3, 4, 5
= n

Rule for the sequence = $1n^2 + n$
= $n^2 + n$

(6)

Qu. 1

n	1	2	3	4	5
term	2	8	16	26	38

$$n^2 + 3n - 2$$

Find the rules
for these quadratic
sequences.

Qu. 2

n	1	2	3	4	5
term	7	17	31	49	71

$$2n^2 + 4n + 1$$

Qu. 3

n	1	2	3	4	5
term	9	17	31	51	77

$$3n^2 - n + 7$$

Qu. 4

n	1	2	3	4	5
term	8	30	62	104	156

$$5n^2 + 7n - 4$$

Qu. 5

n	1	2	3	4	5
term	6	24	52	90	138

$$5n^2 + 3n - 2$$

Qu. 6

n	1	2	3	4	5
term	11	15	15	11	3

$$-2n^2 + 10n + 3$$

Qu. 7

n	1	2	3	4	5
term	12	26	44	66	92

$$2n^2 + 8n + 2$$

Qu. 8

n	1	2	3	4	5
term	3	6	13	24	39

$$2n^2 - 3n + 4$$

Qu. 9

n	1	2	3	4	5
term	6	17	34	57	86

$$3n^2 + 2n + 1$$