1 (a) A Fibonacci-type sequence starts 3 –8

The sequence is continued by adding the previous two terms.

Work out the next **two** terms.

[2 marks]

3 , −8 , (3 − 8) , (−8 + (3 − 8))

3, −8, −5, −13

Answer −5 (1) and −13 (1)

2 The 5th term of a linear sequence is 17

The 6th term of the sequence is 21

Work out the 100th term of the sequence.

[3 marks]

$T_5 = a + 4d = 17$

$d = 4$ (1)

$a = 17 - 4(4)$

$= 1$ (1)

$T_{100} = 1 + 99(4)$

$= 397$ (1)

Answer 397

3 (a) The term-to-term rule for a sequence is

add 4 then divide by 2

The 1st term of the sequence is 36

Work out the 3rd term.

[2 marks]

2nd term : $\frac{36+4}{2} = 20$ (1)

3rd term : $\frac{20+4}{2} = 12$

Answer 12 (1)

3 (b) The term-to-term rule for a different sequence is

divide by 3 then add 10

The 2nd term of this sequence is 60

Work out the 1st term.

[2 marks]

let 1st term = x . $\frac{x}{3} + 10 = 60$

$x = (60 - 10)3$ (1)

$= 150$

Answer 150 (1)

4 Here is a rule for a sequence.

> After the first two terms, each term is the sum of the previous two terms.

The first five terms are p 23 q 57 r

Work out the values of p, q and r.

[2 marks]

$p + 23 = q$

$23 + q = 57$

$q = 57 - 23 = 34$

$p + 23 = 34$

$p = 34 - 23 = 11$

$34 + 57 = r$

$r = 91$

$p =$ 11

$q =$ 34 (2)

$r =$ 91

5 The nth term of a sequence is $19 - 4n$

What is the **smallest** value of n that gives a negative term?

[2 marks]

$n = 1$, $19 - 4(1) = 15$

$n = 2$, $19 - 4(2) = 11$ (1)

$n = 3$, $19 - 4(3) = 7$

$n = 4$, $19 - 4(4) = 3$

$n = 5$, $19 - 4(5) = -1$

Answer 5 (1)

6 (a) The term-to-term rule for a sequence is

multiply by 2

The 3rd term of the sequence is 46

Work out the 1st term.

Give your answer as a decimal.

[3 marks]

let 1st term = x

2nd term = $2x$

3rd term = $4x$

$4x = 46$ (1)

$x = \frac{46}{4} = 11.5$ (1) (1)

Answer 11.5

6 (b) The term-to-term rule for a different sequence is

subtract k

The 1st term is 34

The 4th term is 10

Work out the value of k.

[3 marks]

1st term = 34

2nd term = $34 - k$ (1)

3rd term = $34 - 2k$

4th term = $34 - 3k = 10$

$3k = 34 - 10 = 24$ (1)

$k = 8$ (1)

$k =$ 8

7 A is an **arithmetic** progression.

Here are the first four terms.

13 16 19 22

G is a **geometric** progression.

Here are the first four terms.

2 4 8 16

nth term of A = 8th term of G

Work out the value of n.

[4 marks]

A : $a = 13$, $d = 3$ (1)

G : $a = 2$, $r = 2$

G : $T_8 = 2 \times 2^7 = 256$ (1)

$256 = 13 + (n-1)3$ (1)

$243 = (n-1)3$

$n - 1 = 81$

$n = 82$ (1)

$n =$ 82

8 A linear sequence starts

7 10 13 16

Work out an expression for the *n*th term of the sequence.

[2 marks]

$a = 7$, $d = 3$

$T_n = 7 + (n-1)3$

$= 7 + 3n - 3$

$= 4 + 3n$ (2)

Answer $4 + 3n$

9 (a) The term-to-term rule for a sequence is

subtract 1 then multiply by 5

The 1st term is 4

Work out the 3rd term.

[2 marks]

2nd term : $(4-1) \times 5 = 15$ (1)

3rd term : $(15-1) \times 5 = 70$ (1)

Answer 70

9 (b) The term-to-term rule for a different sequence is

add 20 then divide by 2

The 2nd term is 50

Work out the 1st term.

[2 marks]

let 1st term = x

$$\frac{x+20}{2} = 50$$

$$x + 20 = 100 \quad (1)$$

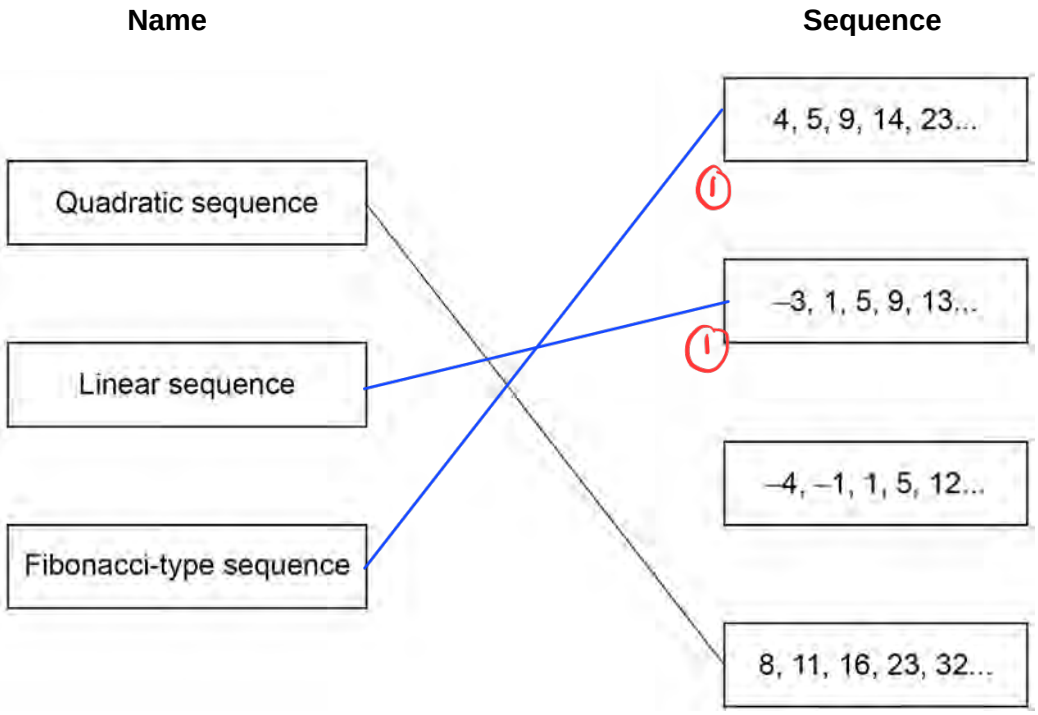
$$x = 80$$

Answer 80 (1)

10 Match the name to the correct sequence.

One has been done for you.

[2 marks]



11

x	0	2	4	6	8	10
y	3	7	11	15	19	23

+2 +2 +2 (above the x row) +4 +4 +4 (below the y row)

The x-values in the table make a linear sequence.

The y-values in the table make a different linear sequence.

11 (a) Complete the table.

[2 marks]

12 Event A has taken place every 4 years.

Event B has taken place every 3 years.

Both events took place in 2019

Work out the last year, before 2019, when both events took place.

[2 marks]

Backward →

Event A : 2019, 2015, 2011, (2007) (1)

Event B : 2019, 2016, 2013, 2010, (2007)

Answer 2007 (1)

13 (a) Here is the rule for a sequence.

After the first two terms, each term is the sum of the previous two terms

The 1st term is 33

The 2nd term is x

The 4th term is 73

Work out the value of x.

[3 marks]

3rd term = $33 + x$

4th term = $73 = x + 33 + x$

$73 = 2x + 33$

$2x = 73 - 33$

$2x = 40$

$x = \frac{40}{2} = 20$

(3)

$x =$ 20

13 (b) An expression for the nth term of a different sequence is $n - n^2$

Ruth says,

"All the terms will be negative because n^2 is always greater than n."

Is she correct?

Tick a box.

☐ Yes ☑ No

Give a reason for your answer. (1)

[1 mark]

The first term is zero.

14 A linear sequence has

- 1st term = 10
- 1st term + 2nd term = 39

Work out the 5th term.

[4 marks]

2nd term = 39 − 10 = 29 ✓(1)

a = 10

d = 29 − 10 = 19 ✓(1)

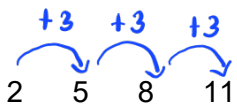
$T_5 = 10 + (5-1)\,19$ $T_n = a + (n-1)d$

$= 10 + 4(19)$ ✓(1)

$= 86$

Answer 86 ✓(1)

15 A linear sequence begins



Work out an expression for the nth term.

[2 marks]

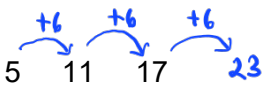
$T_n = 2 + (n-1)3$

$= 2 + 3n - 3$

$= -1 + 3n$

Answer $T_n = -1 + 3n$ ✓ (2)

16 Here are the first three terms of a linear sequence.



16 (a) Write down the next term.

[1 mark]

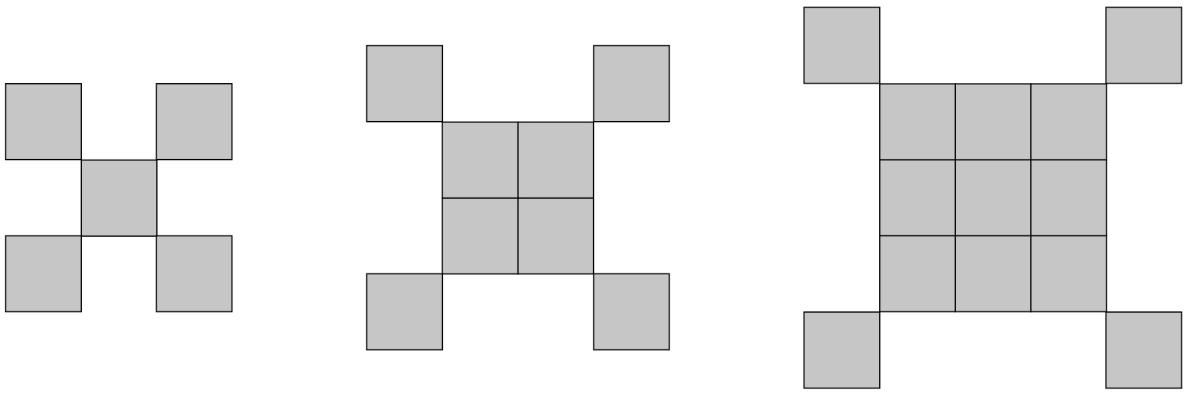
Next term 23 ✓ (1)

16 (b) Describe the term-to-term rule.

[1 mark]

Term-to-term rule +6 ✓ (1)

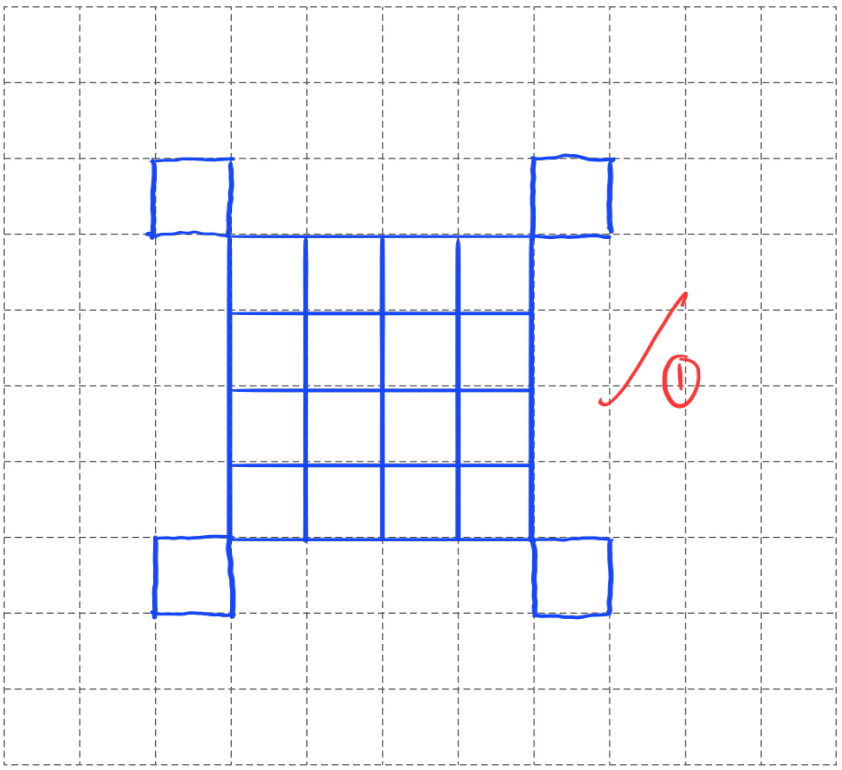
17 Here are the first three Patterns in a sequence made up of small squares.



Pattern 1 Pattern 2 Pattern 3

17 (a) On the grid, draw Pattern 4

[1 mark]



17 (b) The expression for the number of small squares in Pattern n is $n^2 + 4$

Work out the least value of n for which the number of small squares is greater than 500

[1 mark]

$n^2 + 4 > 500$

$n^2 > 496$

$n > 22.3...$

$n = 23$ (smallest integer after 22.3...)

$n =$ 23 ✓ (1)