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___ and ___−13___

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 sequence of patterns is made using horizontal sticks and vertical sticks.
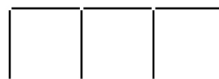
Pattern 1   Pattern 2   Pattern 3

The table shows the number of horizontal sticks and vertical sticks in each pattern.

Pattern	Number of horizontal sticks	Number of vertical sticks
1	2	2
2	4	3
3	6	4

What fraction of the total number of sticks in Pattern n are horizontal?

Give your answer in terms of n.

[3 marks]

horizontal $= 2 \times n = 2n$

vertical $= n+1$

total $: 2n + n + 1$

$= 3n+1$

$\dfrac{\text{horizontal}}{\text{total}} = \dfrac{2n}{3n+1}$ ③

Answer $\dfrac{2n}{3n+1}$

4 The first three terms of a sequence are x y xy xy^2 x^2y^3

The sequence is continued by multiplying the previous two terms.

4 (a) Circle the 5th term of the sequence.

[1 mark]

x^3y^3 $\qquad$ x^5y^5 $\qquad$ x^3y^4 $\qquad$ $\left(x^2y^3\right)$

(1)

4 (b) The 8th term of the sequence is x^8y^{13} $\qquad$ x^8 is always positive

The value of this term is negative.

What does this mean about the values of x and y ?

Tick **one** box for each row.

[2 marks]

	Must be positive	Must be negative	Could be either
x			✓ (1)
y		✓ (1)	

5 A is an **arithmetic** progression.

Here are the first four terms.

$$13 \qquad 16 \qquad 19 \qquad 22$$

G is a **geometric** progression.

Here are the first four terms.

$$2 \qquad 4 \qquad 8 \qquad 16$$

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

$$n = \underline{\qquad 82 \qquad}$$

6 Four consecutive triangular numbers are   6   10   15   21   28

4   5   6   7
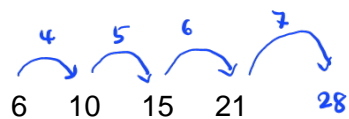
Write down the next triangular number.

[1 mark]

Answer _____ 28   (1) _____

7   The 47th triangular number is 1128

The 48th triangular number is 1176
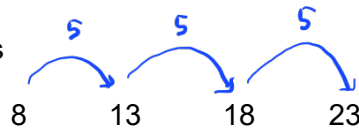
Work out the 49th triangular number.

[1 mark]

$$\frac{49\,(50)}{2} = 1225$$

Answer _____ 1225 ①

8   The nth terms of two linear sequences, A and B, are added to give the nth term of a new sequence.

The new sequence starts

$$5 \qquad 5 \qquad 5$$

8   13   18   23

The nth term of sequence A is $n + 1$

Work out the nth term of sequence B.

[4 marks]

$a = 8 \quad , \quad d = 5$ ①

$T_n = 8 + (n-1)\,5$

$= 8 + 5n - 5$

$= 5n + 3$ ①

$A + B = 5n + 3$

$n + 1 + B = 5n + 3$

$B = 5n - n + 3 - 1$ ①

$= 4n + 2$

Answer $4n + 2$ ①

9 (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 ①

4th term = 73 = x + 33 + x ①

73 = 2x + 33

2x = 73 − 33

2x = 40

$x = \dfrac{40}{2}$ = 20 ①

$x =$ _____20_____

9 (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."
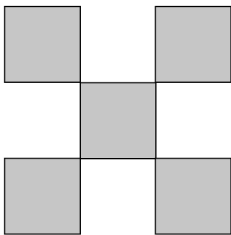
Is she correct?

Tick a box.

☐ Yes   ✓ No
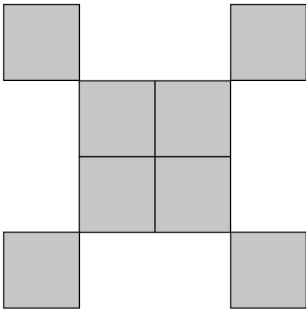
Give a reason for your answer. ①

[1 mark]

The first term is zero.

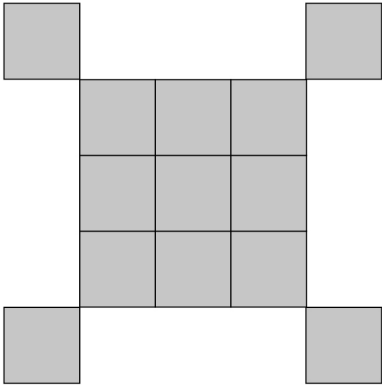**10**   Here are the first three Patterns in a sequence made up of small squares.
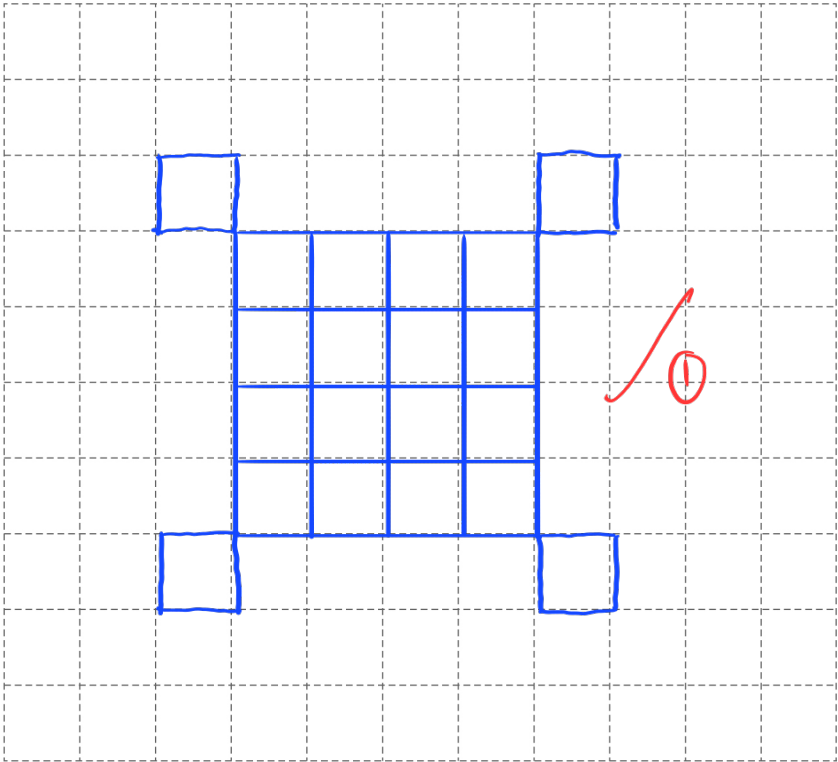
Pattern 1   Pattern 2   Pattern 3

10 (a)   On the grid, draw Pattern 4

[1 mark]

10 (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 $22.3...$)

$n = \underline{\quad 23 \quad}$