

1 Algebraic notation: multiplying

- a) Simplify $(2a^3b)^2 \times 3ab^4$
b) Find the missing term. $\square \times (-3x^2y)^2 = 36x^7y^3$

$$a) 4a^6b^2 \times 3ab^4 = 12a^7b^6$$

$$b) (-3x^2y)^2 = 9x^4y^2: 4x^3y$$

2 Term to term rules

- a) The rule is multiply by k , then subtract 4. The 1st term is 3 and the 3rd term is 60. Find both values of k .
b) The rule is subtract 5, then multiply by 2. The 3rd term is 0. Find the 1st term.

$$a) (3k - 4)k - 4 = 60, (k + 4)(3k - 16) = 0$$

$$k = -4 \text{ or } \frac{16}{3}$$

$$b) \text{ back: } 0 \div 2 + 5 = 5, 5 \div 2 + 5 = 7.5$$

3 Square and triangular numbers

The n th triangular number is $\frac{n(n+1)}{2}$.

- a) Prove that two triangular numbers next to each other add to a square number.
b) T is a triangular number and $8T + 1 = 441$. Which triangular number is T ?

$$a) \frac{n(n+1)}{2} + \frac{(n+1)(n+2)}{2} = \frac{(n+1)(2n+2)}{2}$$

$$= (n+1)^2$$

$$b) T = 440 \div 8 = 55 = 10 \times 11 \div 2: \text{ the 10th}$$

4 Fibonacci type sequences

Each term is the sum of the two terms before it. The first two terms are a and b .

- a) Show that the sum of the first six terms is 4 times the 5th term.
b) The 3rd term is 7 and the 6th term is 25. Find a and b .

$$a) a, b, a+b, a+2b, 2a+3b, 3a+5b$$

$$\text{sum } 8a + 12b = 4(2a + 3b)$$

$$b) a + b = 7, 3a + 5b = 25: a = 5, b = 2$$

Sequences

revision mat answers

5 The n th term of a linear sequence

$\frac{3}{5}, \frac{5}{8}, \frac{7}{11}, \frac{9}{14}, \dots$

- a) Find the n th term.
b) Show that no term is equal to $\frac{2}{3}$.

$$a) \text{ tops } 2n + 1, \text{ bottoms } 3n + 2: \frac{2n + 1}{3n + 2}$$

$$b) 6n + 3 = 6n + 4, \text{ but } 3 \neq 4$$

6 The n th term: using it

Some numbers are in both sequence A, $4n + 1$, and sequence B, $6n - 1$.

- a) Find an expression for the n th number in both.
b) How many of them are less than 200?

$$a) 5, 17, 29, 41, \dots: 12n - 7$$

$$b) 12n - 7 < 200, n \leq 17: 17 \text{ numbers}$$

7 The n th term of a quadratic sequence

5, 3, -3, -13, -27, ...

- a) Find the n th term.
b) Prove that every term is odd.

$$a) -2n^2, \text{ then } 7, 11, 15, 19, 23: -2n^2 + 4n + 3$$

$$b) 2(-n^2 + 2n + 1) + 1: \text{ even } + 1, \text{ so odd}$$

8 Types of sequences

- a) A geometric sequence has 2nd term 12 and 5th term 96. Find the 1st term.
b) $\sqrt{2}, 2, 2\sqrt{2}, 4, \dots$ is a geometric sequence. Which term is 64?

$$a) r^3 = 96 \div 12 = 8, r = 2: 12 \div 2 = 6$$

$$b) \text{ nth term } (\sqrt{2})^n, 64 = (\sqrt{2})^{12}: \text{ the 12th}$$