M1.

Cuboid 1 1 × 2 × 2

M1

Cuboid 2 2 × 2 × 3

M1

Cuboid 3 3 × 2 × 4

Continues for at least 2 more products seen.

M1

Cuboid 16 16 × 2 × 17

A1

Finds a formula and substitutes n = 16 and makes a valid conclusion, eg no 544 (> 500)

Strand (ii).

NB *SC2 544 and valid conclusion with no working.*

Q1

Alternative 1

First four cuboids have 4, 12, 24, 40 cubes

M1

Recognises the rule +8, +12, +16 and shows +20 or 60

M1

Continues the list to the 16th cuboid, showing values with at most one error

60, 84, 112, 144, 180, 220, 264, 312, 364, 420, 480, 544

M1

544 for 16th value

A1

Makes a valid conclusion based on their 16th term first 2 Ms awarded, eg no 544 (> 500)

Strand (ii).

Q1

Alternative 2

4 12 24 40

8 12 16

4 4

Numbers of cubes identified and second difference calculated

M1

$2n^2$

M1

2 4 6 (+ $2n$)

Difference between $2n^2$ and original series calculated

M1

$2n^2 + 2n$

$2(16)^2 + 2 \times 16$

A1

Finds a quadratic formula starting with $2n^2$ and substitutes $n = 16$ and makes a valid conclusion, eg no 544 (> 500)

Strand (ii).

Q1

Alternative 3

Width = n

M1

Height = $n + 1$

M1

Depth 2 so volume = $2 \times n \times (n + 1)$

M1

$2n^2 + 2n$

$2(16)^2 + 2 \times 16$

A1

Finds a quadratic formula and substitutes $n = 16$ and makes a valid conclusion, eg no 544 (> 500)

Strand (ii).

Q1

[5]

M2.

First **and** second differences correct

i.e. 4 6 8 (10)

2 2 (2)

M1

Correctly subtracts their $\frac{2}{2}n^2$ from given sequence

i.e. 10 11 12 (13 14)

M1

(1)n

dep on M2

M1dep

$n^2 + n + 9$

oe e.g. $n^2 + n + 10 - 1$

A1

Alternative method
Any three of
$a + b + c = 11$
$4a + 2b + c = 15$
$9a + 3b + c = 21$
$16a + 4b + c = 29$
$25a + 5b + c = 39$

Allow one error but each of their three equations must have a, b *and* c

M1

Eliminates one variable to obtain a pair of equations in two variables

e.g. $3a + b = 4$ **and**

$5a + b = 6$

Allow one error

M1

Eliminates one variable correctly

e.g. $2a = 2$

dep on M2

M1dep

$n^2 + n + 9$

oe e.g. $n^2 + n + 10 - 1$

A1

[4]

M3.

$(5n - 3)^2 + 1$

M1

$25n^2 - 15n - 15n + 9 + 1$

Allow one error

Must have an n^2 term

M1

$25n^2 - 30n + 10$

A1

$5(5n^2 - 6n + 2)$

oe

e.g. shows that all terms divide by 5 or explains why the expression is a multiple of 5

B1ft

Alternative method 1

Use of $an^2 + bn + c$ for terms of quadratic sequence

i.e. any one of

$a + b + c = 5$

$4a + 2b + c = 50$

$9a + 3b + c = 145$

M1

$3a + b = 45$

$5a + b = 95$

For eliminating c

M1

$25n^2 - 30n + 10$

A1

$5(5n^2 - 6n + 2)$

oe

e.g. shows that all terms divide by 5 or explains why the expression is a multiple of 5

B1ft

Alternative method 2

5 50 145 290

45 95 145

2nd difference of 50 ÷ 2 (= 25)

$25n^2$

M1

Subtracts their $25n^2$ from terms of sequence

-20 -50 -80

$-30n$

M1

$25n^2 - 30n + 10$

A1

$5(5n^2 - 6n + 2)$

oe

e.g. shows that all terms divide by 5 or explains why the expression is a multiple of 5

B1ft

[4]