As outcomes, Year 8 pupils should, for example:

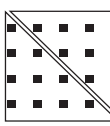
As outcomes, Year 9 pupils should, for example:

Explore spatial patterns for triangular and square numbers. For example:

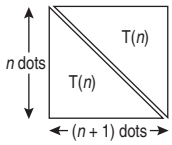
- Generate a pattern for specific cases of T(n), the nth triangular number:

By considering the arrangement of dots, express T(n) as the sum of a series:
$T(n) = 1 + 2 + 3 + \ldots + n$

By repeating the triangular pattern to form a rectangle, deduce a formula for T(n):

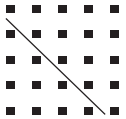


$T(4) + T(4) = 4 \times 5$



$T(n) + T(n) = n(n + 1)$ or $T(n) = \frac{1}{2}n(n + 1)$
Use this result to find the sum of the first 100 whole numbers: $1 + 2 + 3 + \ldots + 100$.

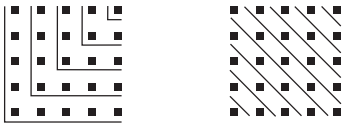
- Split a square array of dots into two triangles:



$T(4) + T(5) = 5^2$

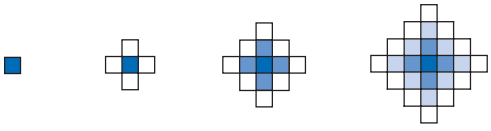
Deduce the result $T(n - 1) + T(n) = n^2$.
Test it for particular cases.

Consider other ways of dividing a square pattern of dots. For example:



Deduce results such as $1 + 3 + 5 + 7 + 9 = 5^2$.
Generalise to a formula for the sum of the first n odd numbers: $1 + 3 + 5 + \ldots + (2n - 1) = n^2$.
Say what can be deduced from the other illustration of dividing the square.

- Certain 2-D 'creatures' start as a single square cell and grow according to a specified rule. Investigate the growth of a creature which follows the rule 'grow on sides':



Stage 1	Stage 2	Stage 3	Stage 4 …
1 cell	5 cells	13 cells	25 cells …

Investigate other rules for the growth of creatures.