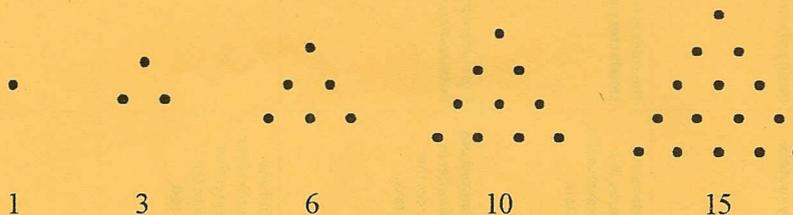


STELLAR NUMBERS

SL TYPE I

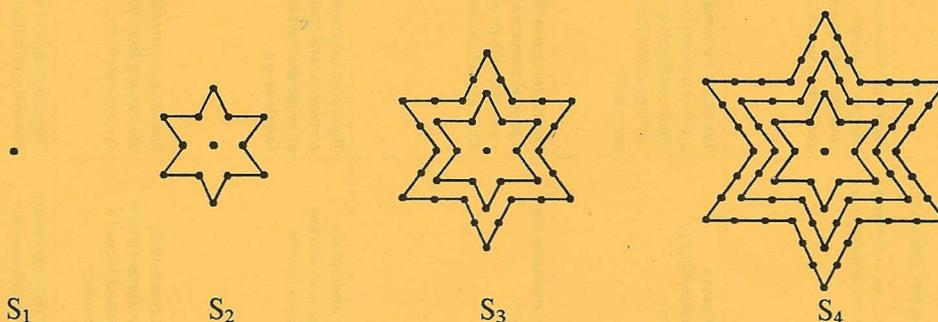
Aim: In this task you will consider geometric shapes which lead to special numbers. The simplest example of these are square numbers, 1, 4, 9, 16, which can be represented by squares of side 1, 2, 3 and 4.

The following diagrams show a triangular pattern of evenly spaced dots. The numbers of dots in each diagram are examples of **triangular numbers** (1, 3, 6, ...).



Complete the triangular numbers sequence with three more terms.
Find a general statement that represents the n^{th} triangular number in terms of n .

Consider **stellar** (star) shapes with p vertices, leading to p -stellar numbers. The first four representations for a star with six vertices are shown in the four stages S_1 – S_4 below. The 6-stellar number at each stage is the total number of dots in the diagram.



Find the number of dots (*i.e.* the stellar number) in each stage up to S_6 . Organize the data so that you can recognize and describe any patterns.

Find an expression for the 6-stellar number at stage S_7 .

Find a general statement for the 6-stellar number at stage S_n in terms of n .

Now repeat the steps above for other values of p .

Hence, produce the general statement, in terms of p and n , that generates the sequence of p -stellar numbers for any value of p at stage S_n .

Test the validity of the general statement.

Discuss the scope or limitations of the general statement.

Explain how you arrived at the general statement.