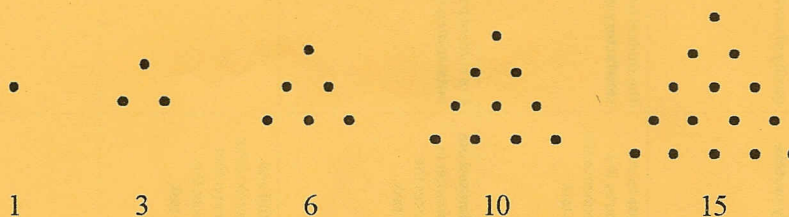


STELLAR NUMBERS

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.*

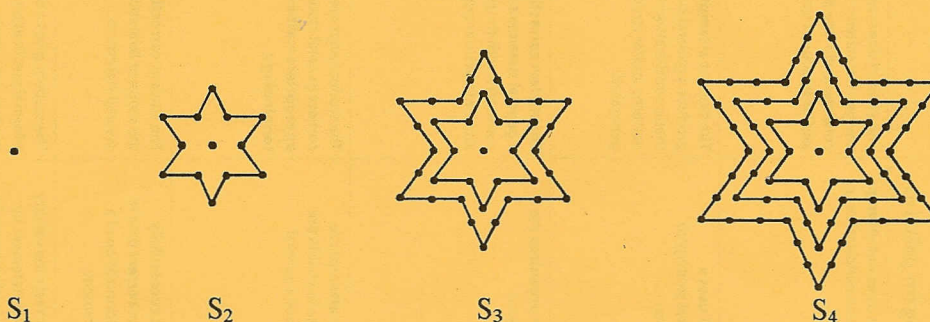
The following diagrams show a triangular pattern of evenly spaced dots. The numbers of dots in each diagram are examples of **triangular** numbers (1, 3, 6, ...).



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.