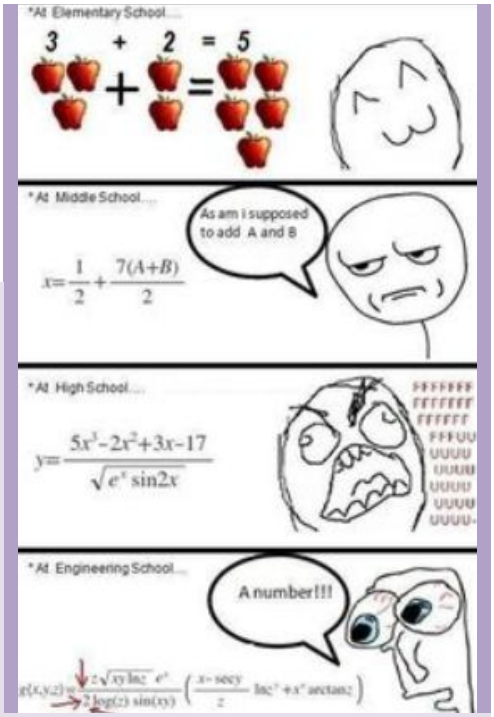
SEQUENCES

Triangular numbers

Definitions

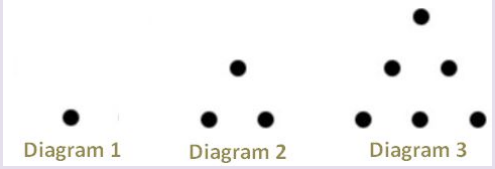
A polygonal number is a number that can be represented as dots arranged in the shape of a regular polygon.

A triangular number counts the objects that can form an equilateral triangle. The nth triangular number is the number of dots composing a triangle with n dots on a side.



Activity

1) Draw the next two diagrams of this sequence :

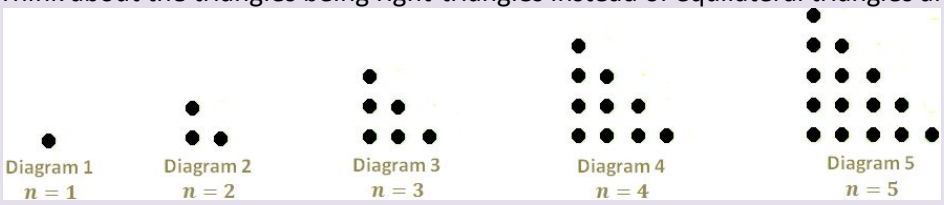


2) Count the dots in each diagram and complete the table below:

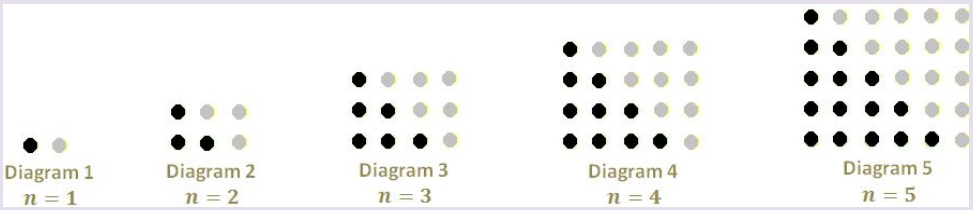
Diagram	1	2	3	4	5	n
Number of dots						T_n

3) Find a term to term rule that describes the sequence (T_n) and express it in words.

4) Instead of using a term to term rule, we look for a formula which would give the nth term of the sequence directly. Think about the triangles being right-triangles instead of equilateral triangles and rearrange the dots:



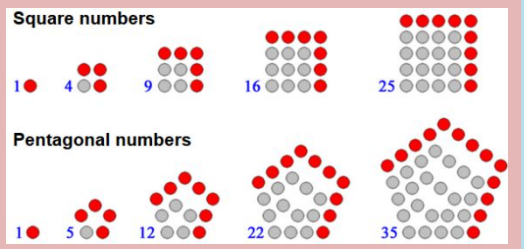
Then double the number of dots, and form them into a rectangle:



The rectangles are n high and $(n+1)$ wide.
Deduce a formula for T_n.

See also

-> Polygonal numbers



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See also

-> Sum of the n first whole numbers

Arithmetic sequence

Proof by induction

Gauss' method

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Algorithm

input: n
output: the n first triangular numbers

```
triang(n)
Prgm
1 → k
0 → s
While k < n + 1
    s + k → s
    k + 1 → k
    Disp s
EndWhile
EndPrgm
```