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Group 5: mathematics

Exponential functions and geometric sequences

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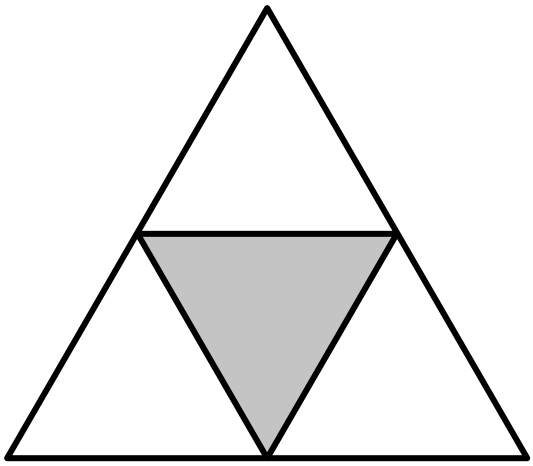
Solution to the question on p. 17 of the magazine.

Solution

Assuming that every triangle drawn is an equilateral triangle, then each triangle is ½ the height of the triangle it is inscribed in. For example, in the diagram below, the shaded triangle will be ½ the height of the whole triangle.



To see this, ask yourself, what is the largest pair of equilateral triangles that can be placed side by side at the base of the equilateral triangle given?

This means that the exponential function for the decreasing heights of the triangles is

$$H(n) = \left(\frac{1}{2}\right)^n$$

where n represents the term of the sequence of triangles (which for the diagram above is $n = 1$) and $H(n)$ is the height of that term in units based on the height of the largest triangle.

For the area of the triangles, notice that each row of the triangles has three triangles of the same size in it, and one of these is shaded each time. This means that the area of all of the triangles will be ⅓ of the area of the largest triangle.