

Maths Enrichment: Sequence Questions from the Team Competition 2018

1. A recurrence formula is given by

$$a_n = \frac{3a_{n-1} + 2a_{n-2}}{3}$$

If $a_0 = 2$ and $a_1 = 4$, find a_3 .

2. Let T_n be the triangle with vertices

$$(2n, 1), (2n + 2, 1), (-4n, -3)$$

find the sum of the areas of the set of triangles

$$\{T_1, T_2, \dots, T_{100}\}$$

3. The increasing sequence of positive integers a_1, a_2, a_3, \dots is defined by

$$a_{n+2} = a_{n+1} + a_n$$

for all $n \geq 1$. If $a_7 = 120$, what is a_8 ?

4. The sequence a_n is defined recursively by

$$a_1 = 7$$

$$a_2 = 3$$

$$a_n = a_{n-1} - a_{n-2}$$

for all $n \geq 3$. Find a_{2018} .

5. Consider the sequence defined recursively by

$$a_0 = b$$

$$a_{n+1} = -\left(\frac{1}{a_n + 1}\right)$$

for $n \geq 1$. Find the value of a_{2018} in terms of b .