



Intermediate Math Circles

Wednesday, March 1, 2017

Problem Set 4

1. Find the tens digit of 2^{2017} .
2. The sequence of numbers a_1, a_2, a_3, \dots satisfies $\frac{a_m}{a_n} = \frac{m}{n}$ for every pair of positive integers m and n . If $a_3 = 5$, evaluate $3a_{20}$.
3. Find a geometric sequence and an arithmetic sequence that have the same first three terms.
4. Consider the sequence $t_1 = 1$, $t_2 = -1$ and $t_n = \left(\frac{n-3}{n-1}\right)t_{n-2}$ where $n \geq 3$. What is the value of t_{2016} ?
5. In a sequence, every term after the second term is twice the sum of the two preceding terms. The seventh term of the sequence is 8, and the ninth term is 24. What is the eleventh term of the sequence?
6. Consider the sequence defined by $t_n = n^2$. Find a recursive definition for this sequence. (There is more than one answer.)