

Name: _____

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1. Is there a triangle whose sides are prime integers and area is an integer?

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2. How many non-negative integer solutions with $y, z > 0$ does the following equation have?

$$2011^x + yz = 2011?$$

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3. Let us consider the sequence 2^n , $n=1,2,3,\dots$, i.e. 2, 4, 8, 16, 32, 64, 128, 256

It is evident that we have period 4 for last digit of the numbers in this sequence, i.e.,

2, 4, 8, 6, 2, 4, 8, 6,

- i)* If we assume that the last two digits of first number is 02, can we find some number in given sequence whose two last digits is 02?
- ii)* If we assume that the last two digits of second number is 04, can we find some number in given sequence whose two last digits is 04?

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4. In the acute-angled triangle ABC , CF is an altitude, with F on AB , and BM is a median, with M on CA . Given that $BM = CF$ and $\angle MBC = \angle FCA$, prove that the triangle ABC is equilateral.

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5. A grown-up worm is 1 meter long. If a worm is **grown-up**, one can dissect it into **two** parts (with an arbitrary ratio of lengths) so that two new worms arise. Each of them immediately starts to grow at a speed of one meter per hour. When the length of a worm reaches 1 meter, it stops growing and becomes grown-up. Is it possible to obtain 10 grown-up worms from a single grown-up worm less than in an hour?