"KamaChallenge-2016"

Mathematical Game.

0:0

From a 2016×2016 square was cut off one corner cell of size 1×1. What is the least number of equal triangles you can cut from the resulting figure?

0:1

Find the smallest natural number n such that multiplying it on 2016 makes a perfect square number.

0:2

In June last year, the number of sunny days in Perm amounted to 25% of the number of cloudy days and warm days – 20% of the amount of cool days. Only 3 days in June were warm and sunny at the same time. How many days were cloudy and cool concurrently?

0:3

How many squares with a vertex $A(2016; -2016)$ exist, for which at least one of the coordinate axes is an axis of symmetry?

0:4

The longest side of a triangle is 24 sm, and the ratio of its angles is 1:5:6. Find the length of its the lowest altitude.

0:5

Find real roots of the equation

$$xe^{-x} + e^{-x} + \frac{x^2}{2} - 1 = 0.$$

0:6

Calculate: $1\cdot 3+3\cdot 5+5\cdot 7+\ldots+2015\cdot 2017-2^2-4^2-\ldots-2016^2$.

1:1

There were 2017 talking parrots on a palm tree. The first parrot said: "The second parrot is yellow!", the second parrot said: "The third parrot is yellow!" and so on. The 2015th parrot said: "The 2016th parrot is yellow!" and the 2016th parrot said: "And the 2017th parrot is a red crocodile!" and the 2017th replied: "I am not a red crocodile!". It is known that all yellow parrots lied and only they did. How many yellow parrots were on the palm tree?

1:2

This is a number $a=\underbrace{99.....9}_{2016\text{цифр}}$. How many numbers "9" are in the decimal representation of a number a^2?

1:3

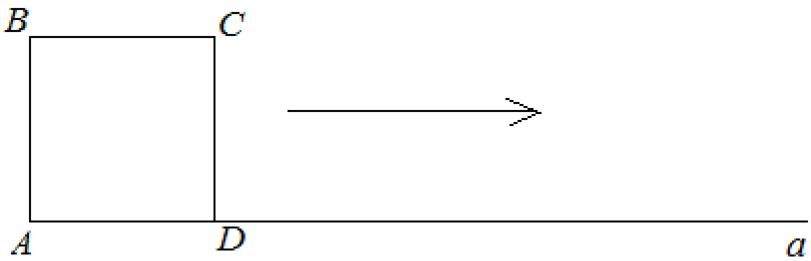
Solve the equation

$\left|\left|\ldots\left|\left|x\right|-1\right|-1\right|\ldots-1\right|=2016$ (there are 2016 numbers "1" in the left part).

1:4

An Assembly shop can make 100 units of product A or 300 units of product B a day. Quality control department can check no more than 150 units a day. Product A costs twice more than product B. How many units of both products should be produce a day to make the total cost maximum?

1:5



A square ABCD (pic.) with a side of 2016 is “rolling” along a line *a*, until a vertex A appears on this line. Each time the square rolls over the right-bottom vertex (i.t. at first it rolls over dot D, then over dot C and finally over dot B). What is the path length that dot A has passed?

1:6

Find the first digit of the smallest number, which can be divided into 4 and the sum of its digits is 2016.

2:2

There are 12 integer numbers on a blackboard. Products of numbers of each pair were found and it appears that 21 of these products are negative. How many positive products there were?

2:3

Let $S(x)$ is a sum of digits of a real number x. Solve the equation:

$x + S(x) = 2016$.

2:4

A straight line passing through the vertex of a triangle divides it into two similar triangles with the similarity factor $\sqrt{3}$. Find the angles of a triangle.

2:5

Three horses participate in a horse race. To win the first horse bets are accepted from calculation $5:1$ (it means that if the first horse wins, the player will return the money which he put on the hors, and plus 5 times more; otherwise the player loses the bet), to win the second - $4:1$ and to win the third - $k:1$. Using what the smallest integer number k you can allocate rates to whatever the outcome of the race to stay in the win?

2:6

The ratio of the sum of the first three members of increasing arithmetic progression to the sum of its subsequent seven members is $7:3$. Find the difference of the progression, if it is known that it has two neighboring members whose product equals to $-\frac{7}{4}$.

3:3

Solve system of equations

$$\begin{cases} x_1 + x_2 + \ldots + x_{2014} + x_{2015} = 2016, \\ x_1 + x_2 + \ldots + x_{2014} + x_{2016} = 2015, \\ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \\ x_1 + x_3 + \ldots + x_{2015} + x_{2016} = 2, \\ x_2 + x_3 + \ldots + x_{2015} + x_{2016} = 1. \end{cases}$$

3:4

Find all positive integers n, m, for which the validity of the equation $n! + 24 = m^2$.

3:5

A rectangle is marked on graph paper and its vertices are at the grid points, the sides of the rectangle are m and n, the numbers m and n are relatively prime, and $m < n$. The diagonal of the rectangle does not cross 124 cells of this rectangle exactly. Find all possible values of m and n.

3:6

There are 3 points on a plane $P(3-a; 6+2a)$, $Q(1+a; 3-a)$, $R(a-1; 1)$.

For what values of *a* point R is not visible to the P-point

4:4

When you turn the sheet of paper in its plane by 180^0 denote of the numbers 0, 1, 8 has no change, numbers 6 and 9 change to each other, and the recording of the remaining digits become meaningless. What is the probability that a random seven-digit number does not vary when you rotate the sheet of paper in 180^0?

4:5

Solve the equation $[n \lg 2] + [n \lg 5] = 2016$ on the set of integer numbers (here $[x]$ - the integer part of the number *x*).

4:6

How many positive numbers among numbers:

$\sin 1^0$, $\sin 10^0$, $\sin 100^0$, …, $\sin\left(10^{2016}\right)^0$?

5:5

Let's determine a superprime number as a number in which all of its digits are different and it remains prime in spite of any reshuffling of its digits. Find the largest superprime number.

5:6

Function $f(x)$ is a polynomial with integer coefficients and $f(-4)=3$, $19 \le f(3) \le 29$. Find $f(16)$ if it is known that this value belongs to segment $[600;1100]$.

6:6

Will the number $\frac{1}{1996}$ decrease or increase, and in how many times if in a decimal representation of the number we cross out the first nonzero digit after the decimal point?