

## Form 10

1. Prove that the fraction  $\frac{1340n+3}{2010n+4}$  can not be reduced for any whole positive number  $n$ .

2. Let two medians of acute triangle ABC intersect in a right angle. Prove that, it is possible to construct a right angled triangle using all three medians of triangle ABC.

3. The quadratic equation  $x^2 + ax + b = 0$  has two solutions  $x_1$  and  $x_2$ . Find an equation such that it would have three solutions  $x_1 + x_2$ ;  $-x_1$ ;  $-x_2$  and in the written form of the equation number  $a$  and  $b$  could be used, but numbers  $x_1$  and  $x_2$  can not be used.

4. Solve the inequality  $|x - 1| < ax - a$ , if  $a$  is given real number.

5. Consider  $n$  houses built in a circle, where each house has a number from 1 to  $n$ . For Christmas each of the  $n$  houses was given to one of the  $n$  dwarfs. To make it more fun, if the dwarf was assigned to the house with number  $k$ , it went to live in the house with number  $k^2$  (counting from the first house and continuing to count for several circles if necessary). Prove that if  $n$  is divisible by 4, then there are no lonely dwarfs. Note: After settling in each house can be inhabited by as many dwarfs as necessary. Lonely dwarfs are dwarfs that are living in the house alone.

