Russian School of Math: Lesson 3

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Abstract

This note reviews a small number of problems from the Russian School of Math test. Written for personal use.

1

Find all integer solutions to the equation

$$3^x + 7 = 2^y$$

2

Solve the equation in integers:

$$x^2 + 5y^2 + 34z^2 + 2xy - 10xz - 22yz = 0$$

Find the product $x \times y \times z$ for which the condition $100 < xyz < 500$ is satisfied.

3

Solve an equation for integers:

$$x^2 = (y+1)^2 + (y+2)^2 + (y+3)^2$$

What is x?

4

Find all integer solutions of equation:

$$x^6 = y^3 + 217$$

Find the value of $z = x + y$ for each solution. What is the greatest value of z?

5

How many pairs of integer solutions (x, y) does the following equation have?

$$x^2 - y! = 2019$$

6

Prove that equation $x^2 - 2y^2 = 1$ has infinitely many integer solutions.