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Solving exponential type of equations in integer numbers

Oleksandr Rudenko

Taras Shevchenko National University of Kyiv

Solving equations in integer numbers is a huge area in number theory. I will consider only an exponential type of such problems. What does it means? The typical example of this kind of problems is the following:

$$a^{b^2} = b^a$$

I will introduce the method of solving general equations of the form

$$a^f = b^g$$

I invented this method when I was teaching high-school children who were going to the IMO. The idea of this method is the following: if we have an equation with some number of „layers" (for instance, in our example we have three „layers" – a, b and 2) we can cross out the lowest of them. The proof of the main theorem is easy, but it is extremely useful to know this method while solving such type of problems, because inventing it every time in each new problem is too messy. And it is so surprising, that such an easy method can be so powerful in a really hard mathematical problems!