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Stan Wagon* (wagon@macalester.edu), Department of Mathematics, Macalester College, Saint Paul, MN 55105. *Automated Proofs of Quadratic Frobenius Formulas.*

The connection between a certain fundamental domain and the Frobenius number $g(A)$ leads to new proofs, which can be totally automated, of formulas such as the following (and similar for the eight other mod-9 congruence classes):

If $k \geq 2$, then $g(9k, 9k + 1, 9k + 4, 9k + 9) = 9k^2 + 18k - 2$

Similar formulas are proved for quadratic progressions up to $(a, a + 1, a + 4, \dots, a + 49)$, and computational experiments show that the patterns likely continue, though not in an entirely predictable form.

One can use implemented algorithms to discover such formulas and also to prove that the fundamental domain has a certain algebraic structure, which yields proofs of the formulas. There are some surprises. The general form appears to be $g(a, a + 1, a + 4, a + 9, \dots, a + M^2) = \frac{1}{M^2} (a^2 + ca) - d$, where c and d depend on M and on the mod- M^2 residue of a . The coefficient 18 in the first formula is twice 9, meaning that $c = 2$ in this case. This pattern persists up to $M = 27$, but at 28 the value of c suddenly changes to 1. (Received July 28, 2007)