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The Linear Diophantine Problem of Frobenius

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Given relatively prime positive integers a_1, \dots, a_n , we call an integer t *representable* if there exist nonnegative integers m_1, \dots, m_n such that

$$t = m_1 a_1 + \dots + m_n a_n .$$

We study the *linear diophantine problem of Frobenius*: namely, to find the largest integer which is not representable.

We translate this problem into a geometric one: consider $N(t)$, the number of nonnegative integer solutions (m_1, \dots, m_n) to $m_1 a_1 + \dots + m_n a_n = t$ for any positive integer t . $N(t)$ enumerates the integer points in a polytope. Solving the Frobenius problem now simply means finding the largest zero of $N(t)$. $N(t)$ turns out to be a quasi-polynomial, thereby yielding a straightforward analytic tool to recover and extend some well-known results on this classical problem.

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