Ever since Riemann’s seminal paper on the primes, the zeta function has proved a powerful weapon in the mathematician’s arsenal. In recent years, group theorists have discovered that non-commutative analogues of classical zeta functions in number theory provide an interesting new perspective on the theory of infinite groups. These zeta functions encode in a Dirichlet series arithmetic information about the lattice of subgroups of an infinite group. This lecture will explain how these zeta functions are providing a new bridge between the theory of nilpotent groups and classical arithmetic geometry.