

# Many Cheerful Facts

Organizers: Yael Degany & Jason Ferguson

Friday, 2:00pm–3:00pm, 1015 Evans
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Feb. 12     **Jason Ferguson**, UC Berkeley

*Minkowski Theory and the Four-Squares Theorem*

Abstract: Minkowski theory is a means of using lattices in Euclidean space to derive results in number theory. In this talk I will prove the main theorem of Minkowski theory and use it in two down-to-earth examples: Proving that every prime number congruent to 1 modulo 4 can be written as the sum of two perfect squares, and proving that every positive integer can be written as the sum of four perfect squares. This talk is based on a lecture Prof. Glenn Stevens of Boston University gives every year in PROMYS.

The only prerequisites I will assume are basic linear algebra, group theory, and modular arithmetic. Though I will state and prove Fermat's little theorem and Wilson's theorem in lecture, and also describe the quaternions in lecture, prior experience with these ideas will be helpful.

I am the very model of a modern Major-General,  
I've information vegetable, animal, and mineral,  
I know the kings of England, and I quote the fights historical  
From Marathon to Waterloo, in order categorical;  
I'm very well acquainted, too, with matters mathematical,  
I understand equations, both the simple and quadratical,  
About binomial theorem I'm teeming with a lot o' news,  
With many cheerful facts about the square of the hypotenuse.  
I'm very good at integral and differential calculus;  
I know the scientific names of beings animalculous:  
In short, in matters vegetable, animal, and mineral,  
I am the very model of a modern Major-General.