# Philadelphia Area Number Theory Seminar

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## A Tree of Pythagorean Triples and Its Generalization

**Abstract:** It is known that all primitive Pythagorean triples $(x, y, z)$, that is, all positive integer triples $(x, y, z)$ without common factor satisfying $x^2 + y^2 - z^2 = 0$, can be given a certain tree-like structure. More precisely, if $(x, y, z)$ is such a triple with $y$ even, then there exists a unique sequence $\{k_1, \ldots, k_l\}$ with $k_j \in \{1, 2, 3\}$ such that $(x, y, z)^T = M_{k_1} \cdots M_{k_l}(3, 4, 5)^T$ with

$$M_1 := \begin{pmatrix} 1 & -2 & 2 \\ 2 & -1 & 2 \\ 2 & -2 & 3 \end{pmatrix}, \quad M_2 := \begin{pmatrix} -1 & 2 & 2 \\ -2 & 1 & 2 \\ -2 & 2 & 3 \end{pmatrix}, \quad M_3 := \begin{pmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 3 \end{pmatrix}.$$

We present a generalization of this theorem to different quadratic forms other than the Pythagorean one.

This talk is a progress report on joint work with Emily Nguyen ('16) and Brandon Tauber ('16), which is supported by the Center for Undergraduate Research in Mathematics at Brigham Young University.

Thursday, March 17, 2016
2:40–4:00PM

Bryn Mawr College
Department of Mathematics
Park Science Center **328**

Tea and refreshments at 2:20PM in Park 355