

Triangles and Squares and Polyhedra- Oh My: A Closer Look at Pollock's Conjectures

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### Abstract

The Platonic Solids have been of interest to numerous mathematicians throughout antiquity. In the 19<sup>th</sup> century, Sir Frederick Pollock made two related conjectures in the field of additive number theory through the addition of tetrahedral and octahedral numbers. This paper contains discussions regarding the unique properties of tetrahedral and octahedral numbers and proves Pollock's tetrahedral numbers using various methods, including formulae generated from sigma functions and analyses of trends in Pascal's triangle. However, a satisfactory proof for the octahedral numbers conjectures was not found. Furthermore, using the work in this study on tetrahedral and octahedral numbers and extending the ideas found in this project to dodecahedral numbers, the author attempted to derive a rule for dodecahedra similar to Pollock's conjectures. A new conjecture was formed in a similar fashion to the conjectures formed by Pollock, but no proof was formulated.