CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)	Project Number
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Project Title
The Strengths of All Five Platonic Solids

Abstract

Objectives/Goals

Triangles have always been known as the strongest shape in two dimensions, but are they the strongest in three dimensions? Does shape even make a substantial difference in three dimensions? This experiment looks at which Platonic solid (one of the five shapes that have the same number of sides touching each corner) is the strongest when built out of both cardstock and uncooked Barilla lasagne.

Methods/Materials

A force gauge was used to apply pressure to the shapes made out of the two different materials, and the magnitude of the force was recorded using Logger Pro software. Based on the exerted force when a Platonic deformed (the dependent variable), I was able to get a conclusion to determine what the strongest shape was.

Results

My hypothesis was that the Platonics would, from strongest to least strong, be in this order: tetrahedron, cube, octahedron, icosahedron, dodecahedron. The results partially supported my hypothesis by showing that the three I had predicted were significantly stronger than the other two, but disproved my hypothesis in the sense that the tetrahedron, cube, and octahedron were always bunched up together in front of the other two (there was no significant difference between them). The experiment also showed that, while I was not testing it, cardstock tends to have a series of deformations, while uncooked pasta completely obliterates once a certain threshold is passed.

Conclusions/Discussion

Accomplishing three smashes of each Platonic solid made me conclude that the number of sides and the simplicity of the shape were more important than the strength of the shape that the solid was made of. This means that the strengths of 2D and 3D shapes are independent of one another. The project also ended with a conclusion that the cube, tetrahedron, and octahedron are the strongest Platonic solids.

Summary Statement

I showed that the strongest Platonic solids are the cube, tetrahedron, and octahedron, and that the number of sides in a 3D shape is better at determining its strength than what the actual shapes that construct it are.

Help Received

My mother helped me create a few of the Platonic solids and start the recordings of the pressure, though I analyzed them myself.