

Probability Dodecahedron

Shared by: Diane Brancazio, K-12 Maker Team, MIT Edgerton Center

Specialized tools and materials used:	Experience level required:
Laser cutter, vinyl cutter if modified	Intermediate

Grade Level and Subject: High School Geometry

Topic/Content Standards: Nets, Polyhedron solids, Probability



Summary of Project:

Students make a polyhedron using laser-cut faces and a paper net to support the shape. In math, nets are 2D shapes that can be folded up to make a 3D solid shape. Students choose a solid and create a plan for the context/use of their finished model. They design the net and the face images using 2D modeling software, then laser cut the individual faces and the paper net. To assemble the model, the faces are glued onto the net, which is then hot-glued into shape as it is folded up.

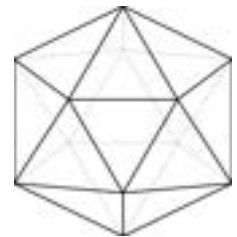
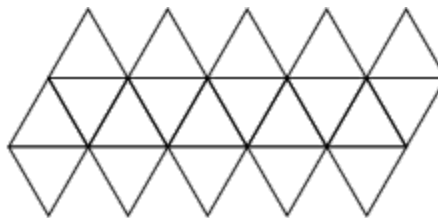
The dodecahedron has 12 identical faces (it is a Platonic solid) which all have the same chance of being on top when the shape is “rolled”. This model is used to do a demonstration of probability. The faces are: 6 stars, 3 hearts, 2 diamonds, and 1 circle, and the probability of them showing up (after many rolls) should be star 50%, heart 25%, diamond 16.6%, and circle 8.3%.

The shapes are presented and displayed in the class or shared with other math classes as learning tools.



Process note: The net is cut from paper on the laser cutter and pre-folded to confirm the fit. The laser-cut wood pieces are then glued onto the paper.

Other shapes:
A more challenging Platonic solid is the 20-sided icosahedron.



For non-probability geometry challenges, the soccer ball is a net using 5 and 6-sided polygons.



Suggested resources:

- https://www.mathsisfun.com/platonic_solids.html
- <https://plus.maths.org/content/imaging-maths-unfolding-polyhedra>
- https://www.math-drills.com/special/world_cup_2014_math_net_of_a_soccer_ball.php
- <https://mathworld.wolfram.com/Deltoidalicositetrahedron.html>