
Subject: D16 Contest

Posted by [Magic](#) on Mon, 10 Sep 2012 05:56:58 GMT

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Hello all,

As you know, the Kickstater launched by Impact! Miniatures to mass produced some of my Truncated Sphere dice was very successful. But during this Kickstater Tom from Impact! challenged me to create a D16 with numbers on faces (my own version had numbers on edges). I found what I think is the best solution for this problem.

But Tom and I are not fully satisfied with this design.

So now, it's my turn to challenge you! If you can find a better design than the one described bellow, Tom will offer you a Shapeways prepaid gift coupon of \$100.

The die must satisfy the following requirements:

- Must be a 16-sided die (this one was obvious)
- Must be a Truncated Sphere: this means that you must first design a polyhedron with all the faces at the same distance from the center, and then intersect it with a sphere of the appropriate size - not too small so that most of the disc forming the faces of the die will touch and not too big so that those faces remain circular and do not overlap.
- Must have numbers on faces: to achieve that, each face must have an opposite face that is parallel.
- Must be better than my solution: the faces must not be too small - 48° or more of separation (I will explain what it is) are recommended and the rounded part must be evenly distributed. This excludes the dipyramid for instance.

You can now participate to the contest, but I'd like to give you some extra information.

Here is a full description of my own solution, so that you do not submit the same design.

I describe my dice by the numbers of faces by layers and, for each layer, the angle Theta that is between the normal of the face with the vertical axis (or if you prefer: the angle between the face and the horizontal plane) and then, for each face of the layer, the angle Phi giving its orientation around the vertical axis (a kind of latitude).

My D16 has its 16 faces distributed on 5 layers: 1+4+6+4+1

- First and last layer: one horizontal face. Basically, the die has two poles (faces A1 and A2). Theta=0 and 180° , Phi is meaningless in this case.
- Second and 4th layer: 4 faces of type B. For the 1st layer I have Theta is 49.627° and Phi= $\pm 33.4258^\circ$ and $\pm 146.5742^\circ$ (the sum of both values is 180°). The 4th layer is

symmetric relatively to the horizontal plane (the equator).

- 3rd layer, the equator. Obviously $\Theta=90^\circ$, and there are 2 kinds of faces. I have 4 faces of kind C for which $\Phi=\pm 65.1865^\circ$ and $\pm 114.8135^\circ$ (the sum of both values is 180°) and 2 faces of kind E ($\Phi=0^\circ$ and 180°).

Of course if you decide to put the faces of kind D at the pole, the new repartition of layer is $1+4+2+2+2+4+1$, and if you put two C faces at the pole it is $2+4+4+4+2$ with different Θ and Φ angles. So check carefully that you are not submitting the same solution with a different orientation.

You can see it as my D14 that has faces oriented in the directions of the 6 faces and the 8 vertices of a cube where you would have replace two opposite faces by two pairs of faces (the kind C). By doing so, the faces corresponding to the vertices of the original cube are moved (the kind C) while the one corresponding to the faces of the cube that have not been doubled remain unchanged (kind A and D).

The separation I was speaking before is an important parameter. This is the angle at the vertex of the cone that has as a basis one face and at the vertex the center of the die. If r_2 is the distance from one face to the center and r_1 the radius of the sphere then the separation is $2 \cdot \arccos(r_2/r_1)$. Here the separation is $49,47^\circ$ approximately (for a distance between two parallel faces of 20.00mm, the diameter of the sphere is 22.02mm).

You have until September 30th to submit a design by answering this post. Tom will decide who the winner is if we have one. Note that by participating to this contest you accept that your design can be reused and modified by me or by Impact! Miniatures for our own usage, the compensation being the prize of the contest (\$100 in prepaid gift coupon).

Good luck!