
Subject: Reuleaux Triangle Spheriforms
Posted by [ualrkids](#) on Thu, 01 Apr 2010 02:07:48 GMT
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This is my first order from shapeways. These are reuleaux triangles (commonly used in rotary engines) rotated about one of its vertices. The interesting property of this shape is its ability to roll just like a sphere, meaning that it has a constant width regardless of orientation. I am very pleased with the results.

Sorry for not giving any sense of the scale. They are about the size of a quarter. Here is a link to my shop: <http://www.shapeways.com/shops/greatgeometers>.

File Attachments

- 1) [nicks triangles 001.jpg](#), downloaded 1825 times
 - 2) [nicks triangles 002.jpg](#), downloaded 1823 times
-

Subject: Re: Reuleaux Triangle Spheriforms
Posted by [RalphVdB](#) on Thu, 01 Apr 2010 14:57:45 GMT
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Hi ualrkids

I actually saw this model, but I was wondering what it was for. Now I know, enjoy your models

Subject: Re: Reuleaux Triangle Spheriforms
Posted by [gibell](#) on Fri, 02 Apr 2010 00:45:04 GMT
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Very cool!! Nice idea!

How about making them larger, and hollow?

Subject: Re: Reuleaux Triangle Spheriforms
Posted by [rawkstar320](#) on Fri, 02 Apr 2010 01:00:47 GMT
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rotary engine eh?

You should consider making a replica rotary engine. That would be awesome. I would probably do it...except that I am really super busy haha.

Check out my shop when you get a chance, I have a model RC Engine and a 3 Speed Transmission. I really want to revisit the transmission project to make it work correctly.....

Anyways, those are pretty awesome!

good luck !!

Subject: Re: Reuleaux Triangle Spheriforms
Posted by [ualrkids](#) on Fri, 02 Apr 2010 01:49:05 GMT
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I am planning on doing that. These were really just a proof of concept. I wanted to make sure they were precise enough to maintain there physical properties (constant width). I created them using Maple 13, and I'm not sure how to make hollow objects with it. I have some idea, but I'm not really familiar with any 3d modelling tools. I actually made others with more sides, and they also have a constant width. Here's a link to a video that illustrates why they are special.

http://www.youtube.com/watch?v=jYf3nOYM_mQ&feature=related

Subject: Re: Reuleaux Triangle Spheriforms
Posted by [Ushanka](#) on Fri, 02 Apr 2010 02:21:00 GMT
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It should be pretty straightforward to hollow those out using just Meshlab! I could help out if you want.

How well do they roll?

Subject: Re: Reuleaux Triangle Spheriforms

Posted by [ualrkids](#) on Fri, 02 Apr 2010 03:52:10 GMT

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They actually roll very well. I only ordered two so it makes difficult to keep the book level. If I had three it would make the rolling a lot smoother because I wouldn't have to keep the book perfectly level myself.

Subject: Re: Reuleaux Triangle Spherofoms

Posted by [gibell](#) on Fri, 02 Apr 2010 14:53:36 GMT

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That video is really cool! Three of them, LARGE, in stainless steel would make for a really unusual coffee table base.

I managed to create one that is hollow (see screen shot below). Let me know if you need any help with this.

File Attachments

1) [Reuleaux1.jpg](#), downloaded 1709 times

Subject: Re: Reuleaux Triangle Spherofoms

Posted by [ualrkids](#) on Fri, 02 Apr 2010 14:58:29 GMT

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Do they have to have a hole, or is there a way to make it hollow without one?

Subject: Re: Reuleaux Triangle Spherofoms

Posted by [gibell](#) on Fri, 02 Apr 2010 15:07:41 GMT

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ualrkids wrote on Fri, 02 April 2010 14:58Do they have to have a hole, or is there a way to make it hollow without one?

Unfortunately, to be hollow it has to have a hole, or the support material can't be removed. I put the hole in the top where the surface is flattest. But it still might affect the rolling ...

Subject: Re: Reuleaux Triangle Spherofoms
Posted by [ualrkids](#) on Fri, 02 Apr 2010 15:44:19 GMT
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The top and the bottom could be separate pieces, and then they could either thread together or interlock in some way, so the rolling would be unaffected.

Subject: Re: Reuleaux Triangle Spherofoms
Posted by [rawkstar320](#) on Fri, 02 Apr 2010 15:45:06 GMT
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you could always fill in the hole, or have several small holes that you fill.

Depending on the size (if its stainless) you might be able to fill the holes with solder or something? Sand it smooth, and you should be good to go.

Of course, i dont know how easy it is to solder the stainless...but it seems like it might work.

Coffee table idea: Awesome. I would deff like to see that one made a reality.

Subject: Re: Reuleaux Triangle Spherofoms
Posted by [Ushanka](#) on Sun, 04 Apr 2010 22:59:01 GMT
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If it's made of one of the strong/flexible materials or Sandstone, then yes, there needs to be a hole in the model. But you don't need a hole for the white/black/transparent detail materials or for grey robust! Those can be hollow and have no escape hole.

Subject: Re: Reuleaux Triangle Spherofoms
Posted by [gibell](#) on Sat, 22 May 2010 21:19:42 GMT
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I made some of these on my own. Mine are 3cm in diameter, they are hollowed out but I tried to do something clever to avoid a bump or flat spot when they are rolled over the hole.

It's interesting to place these between two books or boards and shift or spin the top board. It feels

just like there are marbles rolling between them!

You can see lines in these in certain directions. This happened because the print orientation was not as I had planned, they got flipped 90 degrees for some reason.

Here is a link to this model in my shop.

File Attachments

- 1) [IMG_4301_cropped.jpg](#), downloaded 1492 times
 - 2) [IMG_4303_cropped.jpg](#), downloaded 1492 times
 - 3) [IMG_4304_cropped.jpg](#), downloaded 1498 times
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Subject: Re: Reuleaux Triangle Spherofoms
Posted by [Youknowwho4eva](#) on Mon, 24 May 2010 12:46:46 GMT
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The green one looks like a pentagon in the picture, but when I think of the shape, I don't see how it would turn into a pentagon. It hurts my head a little . Very awesome idea, I'll have to catch up on rotaries, I've only briefly looked it up a while ago.

Subject: Re: Reuleaux Triangle Spherofoms
Posted by [Ushanka](#) on Mon, 24 May 2010 21:45:50 GMT
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[Youknowwho4eva](#) wrote on Mon, 24 May 2010 12:46The green one looks like a pentagon in the picture
That's because it probably is a pentagon

You can make solids of constant width by rotating any Reuleaux polygon: reuleaux triangles, reuleaux pentagons, reuleaux heptagons...

Subject: Re: Reuleaux Triangle Spherofoms

Posted by [gibell](#) on Mon, 24 May 2010 21:54:44 GMT

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Yep, all 3 are different. Blue = Reuleaux triangle, orange = rounded Reuleaux triangle, green = Reuleaux pentagon. Each one is just these 2D shapes turned on axis, making a 3D "solid of revolution". The green one looks a lot like a muffin!!

I want to make a Meissner Tetrahedron, but I can't quite figure out its shape from the descriptions.

Subject: Re: Reuleaux Triangle Spherofoms

Posted by [Youknowwho4eva](#) on Tue, 25 May 2010 13:10:10 GMT

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I find wikipedia is good for shape dimensions http://en.wikipedia.org/wiki/Reuleaux_tetrahedron

Subject: Re: Reuleaux Triangle Spherofoms

Posted by [ualrkids](#) on Mon, 14 Jun 2010 03:47:01 GMT

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I wrote a paper on the physical properties of these objects. Thought you all might be interested.

File Attachments

1) [mathmethods\(3\)\(4\).pdf](#), downloaded 216 times

Subject: Re: Reuleaux Triangle Spherofoms

Posted by [ualrkids](#) on Mon, 14 Jun 2010 04:20:25 GMT

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This is the best description I could find, and I couldn't think of a way to make it out of functions in Maple. Maybe you will have more luck.

File Attachments

1) [meissner_en.pdf](#), downloaded 220 times

Subject: Re: Reuleaux Triangle Spherofoms

Posted by [Ushanka](#) on Mon, 14 Jun 2010 22:14:21 GMT

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ualrkids: Thanks a ton for those papers! I had seen papers before on the construction of Meissner tetrahedra, and all of them mentioned "rounding," but this is the only one I've seen that actually explained the process clearly. I don't know about Maple, but I made models of both Meissner tetrahedra in Solid Edge in about an hour.

Next challenge: an open-source GÃ¶mbÃ¶c model! Any tips?

Subject: Re: Reuleaux Triangle Spherofoms

Posted by [gibell](#) on Sun, 07 Nov 2010 15:09:40 GMT

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Thanks to clsn aka Mark Shoulson, I printed out two of his Meissner Tetrahedrons. He designed the objects using Blender such that they had the same width as my Reuleaux Spherofoms (3 cm). I now have 5 solids of constant width to roll with.

Here are some photos of the new solids, and then all 5 of them. I've found the best demo is to put 3 of them on a table and then cover them with a glass plate. This way you can see them rolling around underneath.

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- 1) [IMG_0610_crop.jpg](#), downloaded 856 times
 - 2) [IMG_0616_crop.jpg](#), downloaded 861 times
 - 3) [IMG_0614_crop.jpg](#), downloaded 840 times
 - 4) [IMG_0619_crop.jpg](#), downloaded 854 times
 - 5) [IMG_0615_crop.jpg](#), downloaded 847 times
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Subject: Re: Reuleaux Triangle Spherofoms
Posted by [clsn](#) on Sun, 07 Nov 2010 19:08:14 GMT
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Wow, excellent! Thanks for the pics, gibell! (I still haven't ordered the Meissner solids myself). I've been pondering/tinkering with ways to improve on them, to make the shapes smoother, etc., but looking at the pictures I may not need to. Looking forward to getting a set of all five myself.
