Subject: Dice Fair or Not?
Posted by mctrivia on Wed, 27 Oct 2010 06:19:38 GMT
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With the exception of the 1 die labeled Loaded all my dice have been designed to roll fair. By that I mean:

1) Have a center of gravity within 10um of the dies center(often within 0.1um)
2) All faces have an equally sized area to land on if landing on a flat surface
3) Dice are numbered so oposit sides add to 1 more then the number of sides.
4) All numbers between 1 and the number of sides are used only once.

This desire to make fair has even been extended to my two 4 dimensional dice though rule 1 is only accurate on the 3d model and not the 4d object it represents.

To do this I have had to jump through some hoops with some of my designs.(for example adding pegs to the missing cubes corners in my inverted die design.

I have no intention to change my practice of always making fair unless purposely making loaded, but I wondered what other designers believe that it is important to follow these 4 rules and also weather or not the collectors out there care.

Do you care if a die is fair or not?(total votes: 9)

Yes I only want fair dice 3/(33%)
Yes but if it looks cool enough it doesn't mater 5/(56%)
No looks are all that mater 1/(11%)

Subject: Re: Dice Fair or Not?
Posted by dizingof on Wed, 27 Oct 2010 09:04:50 GMT
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Well ... since i'm headed towards my 100 (!) dice designs .. i'll have to say 4. lighten up..

Subject: Re: Dice Fair or Not?
Posted by clsn on Wed, 27 Oct 2010 11:31:41 GMT

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mctrivia wrote on Wed, 27 October 2010 06:19With the exception of the 1 die labeled Loaded all my dice have been designed to roll fair. By that I mean:

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I don't generally bother with rule 1; ordinary games (not gambling) don't fret about compensating for the weight of the pips, and my designs in general don't lead to *heavy* differences in weight among the sides. Of course, really extreme asymmetry is not acceptable either, but I don't sweat the small stuff. (That said, I also think it's really cool that you do rebalance your dice like that, and it's an awesome feature to have in a die, to be able to say that the pips were resized in order to bring the center of balance back).

Rule 2 is probably a necessary condition for fairness, but not a sufficient one. It isn't just about area; you can have faces of very different shapes with the same area, and some might be long and narrow (and unlikely to be landed on) and some might be wider and more likely. The area should be the same, and so should the shape, and also the dihedral angles with other faces need to be in similar arrangement, etc. It's about how much energy it takes to roll from one face over to the next one.

Rule 3 isn't really necessary or sufficient for fairness. A die whose opposite faces don't add up right isn't less fair than one that does. But it makes it nicer. Rule 4 is pretty obviously necessary, unless you're doing some strange numbering or really creative geometry (I dunno, somehow making sure that the probabilities of a particular pair of faces add up exactly to the probability of another face or something).

I made up a quick-and-dirty spreadsheet for doing chi-square tests on a die; maybe I should post it. Then with each die you can also say "... and with 100 rolls, this die scored x% on the chi-square test, indicating no reason to suspect non-fairness"

Subject: Re: Dice Fair or Not?
Posted by mctrivia on Wed, 27 Oct 2010 12:54:51 GMT
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dizingof you do have some really cool designs.

clsn

The only problem with the Chi-square test is you need to print every die to run the test. mathematical analysis of the die design will let you compute the 4 rules i laid out which should give a fair die(and has for every die i have printed)

you are correct about the shape of the sides being important. Most of my dies have been d6 which make easy to keep the same shape. It is not always easy to do on some other configurations.

Subject: Re: Dice Fair or Not?
Posted by dizingof on Wed, 27 Oct 2010 13:16:20 GMT
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Thank you.
I just added 4 new ones.

Cheers

Subject: Re: Dice Fair or Not?
Posted by Drawn-SteelHero on Fri, 29 Oct 2010 01:19:22 GMT
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I basically agree with Clsn.

1's a nice touch, but for practical purposes, as long as the weight's not too unevenly distributed, it shouldn't make that much difference.
2: All numbered sides should have the same shape and area to guarantee complete fairness.
3: Having conventional die numbering is by no means necessary for fairness, but nice to have, and sates your dice snobs (i.e. Gumball)
4: Probably more like "each number on the die is shown the same number of times". Most dice you only need to have one of each number, but you can also have things like a D6 with 1-3 repeated twice.

But yeah, dice should certainly have an even chance of landing on any given side, but personally I don't think tiny imperfections in the probabilities are anything to worry about.

Andy