Re: Probability of picking a positive rational number at random

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- *From*: S_Paske@xxxxxxxxxxx
- *Date*: Thu, 13 Mar 2008 15:03:57 −0700 (PDT)

On Mar 13, 3:16 pm, Randy Poe <poespam−t...@xxxxxxxxx> wrote:

> On Mar 13, 4:10 pm, S_Pa...@xxxxxxxxxxx wrote:
>
> > From my understanding, the probability of picking a positive rational
> > number at random which is <1 is 50%, and also the probability that
> > this number >1 is also 50%.
>
> > Any thoughts are appreciated.
> > Thanks
>
> Depends on your distribution for picking "at random".
>
> I'm guessing that you mean the numerator n and
> denominator d are independent random variables
> chosen from the same distribution. In that case,
> regardless of the distribution, p(n < d) = p(d < n).
> However, if there is a nonzero probability that
> n = d, then neither p(n<d) nor p(d<n) is 50%.
>
> One more general comment: There is no such thing
> as a uniform distribution over all the natural
> numbers. However, you might choose n and d as
> uniformly distributed on some finite set, say
> {1, 2, ..., 10000}.
>
> > What is the probability that the number is <1/2. What about <2?
> > How about <1/3 or < 3?
>
> Depends on the details of the distribution.
>
> − Randy

I am thinking that if i picked a random integer n>=1 i could use this distribution:
The probability of the exponent of its 2 prime factor=0 is 1/2
The probability of the exponent of its 2 prime factor=1 is 1/4
...
The probability of the exponent of its 3 prime factor=0 is 2/3
The probability of the exponent of its 3 prime factor=1 is 2/9
The probability of the exponent of its 3 prime factor=2 is 2/27
...
The probability of the exponent of its n'th prime factor=k is (Pn−1)/Pn^k
Each prime factor would be independent of the others.

To extend this to the rationals, if k>0 then split each probability into equal parts 1 for negative exponent, 1 for positive exponent.

I am pretty sure with this model that picking a positive rational at random would yield 50% between 0 and 1 and 50% > 1.

But what is the probability of between 0 and 1/2 or between any interval in general?

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