Re: define the division of X/Y

Source: http://sci.tech−archive.net/Archive/sci.math/2006−10/msg02825.html

- *From*: "Proginoskes" <CCHeckman@xxxxxxxxx>
- *Date*: 11 Oct 2006 00:01:37 −0700

schoenfeld.one@xxxxxxxxx wrote:

> Proginoskes wrote:
>
>> schoenfeld.one@xxxxxxxxx wrote:
>>
>>> Proginoskes wrote:
>>>
>>>> Mike wrote:
>>>>
>>>>> where X and Y are two
>>>>> random variables...
>>>>>
>>>>> What is the precise and
>>>>> rigorous condition on Y to
>>>>> avoid the "dividing by
>>>>> zero" problem?
>>>>
>>>> Hmm. Making sure Y is nonzero would do
>>>> it.
>>>>
>>>> Making the probability that
>>>> Y is zero equal to zero might also do it.
>>>
>>> That's an insufficient condition.
>>>
>>> The probabiltiy of drawing 5 out of the Naturals is 0.
>>
>> What distribution are you using?
>>
>>> The probability
>>> of drawing a 0.5 out of the set [0,1] is 0. It does not mean

>>> that they
>>> cannot ever be drawn.

>> But things such as the expected value (and moments) can still be calculated if the probability of dividing by zero is 0.
>>
>> And I did NOT mean that "probability of event E = 0" is the same as "E cannot happen". The more precise statement of my intention was: "Y is nonzero almost everywhere".

> If $P(Y == 0) = 0$ does not imply that X/Y is well defined for all X in Reals, Y in Reals,

That's a weird implication.

> then how $P(Y==0)=0$ help with the OP's question?

Because X and Y are random variables, not arbitrary real numbers. This suggests that the setting is a probability space, not general arithmetic.

The OP (Mike) didn't say exactly what he wanted to do, so all of this is speculation anyway. But I suspect he might want to calculate the probability that X/Y is between 2 or 3, or the expected value of X/Y, or _some_ statistic involving X/Y.

For instance, X and Y might be uniformly distributed over $[-1,1]$, and Mike wants to calculate the probability that X/Y is between 2 and 3. The problem is that X/Y is not defined, so you could end up with an improper integral when trying to calculate this probability.

One solution might be to change the distribution to one of the form:
$p(x) = 1/2$, if x is not 0;
$p(x) = 0$, if $x = 0$.

Then, if Y has this probability distribution, Y will definitely never be 0. The only concern is that this is a different distribution. However, since the probability distribution has been changed on a set of measure 0, you will get the same answer for problems like "What is the probability that $Y > -0.5$?" as you would for the old distribution. However, you can now talk about X/Y, since Y will never be 0.

−−− Christopher Heckman

mailx oracle@xxxxxxxxxxxxxxx
Subject: Division by Zero

I swear, these humans are getting dumber by the minute ...
−−− C
.

.