Re: define the division of X/Y

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- *From*: schoenfeld.one@xxxxxxxxx
- *Date*: 12 Oct 2006 04:12:34 −0700

Proginoskes wrote:

> schoenfeld.one@xxxxxxxxx wrote:
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> > Proginoskes wrote:
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> > > schoenfeld.one@xxxxxxxxx wrote:
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> > > > 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.

It sure is, and it's all yours.

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.

Just because the probability of drawing (y=0) is 0 does not mean that (y=0) is never drawn. The OP necessarily requires that (y=0) is never drawn.

> 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.

I don't see how you came up with that.

> 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.

That's not what the OP asked. The OP asked what were the 'precise and rigorous conditions' for avoiding a divide by zero for random x and random y. You said letting P(y==0)=0 was sufficient. I am saying its insufficient.

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