Dialogue #1

This dialogue occurred in an algebra class that was discussing the relationship between the two patterns in Tables 1 and 2. The class has already determined that the equation to model the relationship given in Table 1 is $y = 2^x$, where x is a natural number and is trying to determine an equation for the relationship in Table 2. From Choppin J. M. (2007) Teacher-orchestrated classroom arguments. *Mathematics Teacher*, 101(4), 306-310.

Table 1	
$y = 2^x$	
x	y
1	2
2	4
3	8
4	16
5	32

Table 2	
x	y
1	1
2	2
3	4
4	8
5	16

Teacher: Delilah, what did you get for your equation?

Delilah: I noticed that each value was one-half of the old one, so I put a half times 2 to the x. [Teacher writes $y = (1/2)(2^x)$.]

Teacher: Can your answer also be written as 2 to the x divided by 2?

Delilah: Multiplying by a half is the same as dividing by 2. Okay. [Teacher writes $y = \frac{2^x}{2}$.]

Teacher: Kibwei, what about you?

Kibwei: When I looked at the new table, I noticed that the values were moved one box down. I tried 2^{x+1} but that didn't work. Then I tried 2^{x-1} and it worked.

Teacher: Okay. So Delilah thinks you can divide by 2, and Kibwei thinks you subtract 1 from the exponent. Are Delilah and Kibwei disagreeing with each other, or is there a way to reconcile their answers?

Luis: Well, they both work, so I'm guessing they're both right, but I haven't figured out why.

Kibwei: It would have to be that dividing by 2 is the same a subtracting 1 from the exponent.

Delilah: Is it possible to write division with exponents, like we do with multiplication?

Teacher: I think that we're close to figuring out and important relationship. Can somebody state what relationship we have just established here?