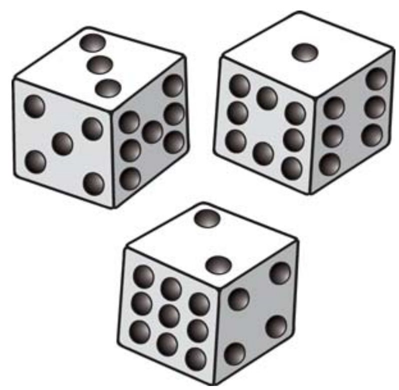
This brainteaser was written by Derrick Niederman.

Consider three six-sided dice A, B, and C, with the following numbers on their sides:

A: 2, 2, 4, 4, 9, 9

B: 1, 1, 6, 6, 8, 8

C: 3, 3, 5, 5, 7, 7



What is the probability that:

- A produces a higher number than B?
- B produces a higher number than C?
- C produces a higher number than A?

Can you find another set of face values for A, B, and C that yield the same properties? (Does such a set even exist?)

Solution: 5/9, 5/9, and 5/9.

Because each die contains three different numbers, there are 3 × 3 = 9 possible outcomes when two of these dice are rolled.

As shown in the tables below, A beats B on 5 out of 9 rolls, 2-1, 4-1, 9-1, 9-6, and 9-8, so the probability that A beats B is 5/9. Similarly, B beats C on 5 out of 9 rolls, 6-3, 8-3, 6-5, 8-5, and 8-7, so the probability that B beats C is also 5/9. Finally, C beats A on 5 out of 9 rolls, 3-2, 5-2, 5-4, 7-2, and 7-4, so the probability that C beats A is, once again, 5/9.

		A		
		2	*4*	*9*
B	*1*	A	A	A
	6	B	B	A
	8	B	B	A

		B		
		1	*6*	*8*
C	*3*	C	B	B
	5	C	B	B
	7	C	C	B

		A		
		2	*4*	*9*
C	*3*	C	A	A
	5	C	C	A
	7	C	C	A

In math, we're used to the inequalities *A* > *B* and *B* > *C* implying that *A* > *C*. This relationship is known as the transitive property. But with these dice, that relationship does not hold, so these dice are often referred to as "nontransitive dice." Like the game *Rock, Paper, Scissors*, they don't obey the laws of inequalities that apply to individual numbers.