Cantor and The Infinite Hotel

1b.) Which is larger, the set of a natural numbers or the set of even integers?

We can figure this out using Georg Cantor’s definition of infinite sets that states, “Two sets have the same cardinality (size) if there is a bijection between them.” In order for there to be a bijection between the set of natural numbers and the even integers, every number in each set would have to match with a completely unique number in the other. Since the set of even integers would cover the same values as the natural numbers the numbers from both sets would match up to a unique value. This means that there is a bijection between the two sets, so according to Cantor’s definition, these two sets are of equal size.

2.)

Dear Real Interval (0,1) Bus Company:

It has come to my attention that you are planning to have your passengers stay at our hotel. Unfortunately, we will be unable to accommodate your passengers. This is due to the fact that the real interval from (0,1) includes fractions, negative numbers, and roots. This means that your real interval bus from (0,1) is larger than the natural numbers interval that the hotel is made up of. We are sorry we can’t accommodate your passengers. We hope that you find a hotel that can.

Regards,

The Infinite Hotel Manager