Theme: Infinity

Two finite sets have a one-to-one correspondence between them iff they have the same number of entries

ex: $\{1, 2, 3, 4, 5\}$ and {Hernandez, Iwakuma, Saunders, Mayer, Bleacher}

Q: Are there more even numbers or natural numbers?
$\{2, 4, 6, 8, \ldots\}$ $\{1, 2, 3, \ldots\}$

Defn: An infinite set is countable iff there is a one-to-one correspondence between it and the natural numbers.

claim: The even numbers are countable.

proof:

NTS that there is a 1-1 correspondence between the evens and $\mathbb{N}$.

2	4	6	8	...	$2n$	...
↕	↕	↕	↕		↕	
1	2	3	4	...	n	...

Thus the evens are countable. ∎

Notice that while $\{2, 4, 6, \ldots\} \subset \mathbb{N}$, in some sense the evens & $\mathbb{N}$ have the same "size."