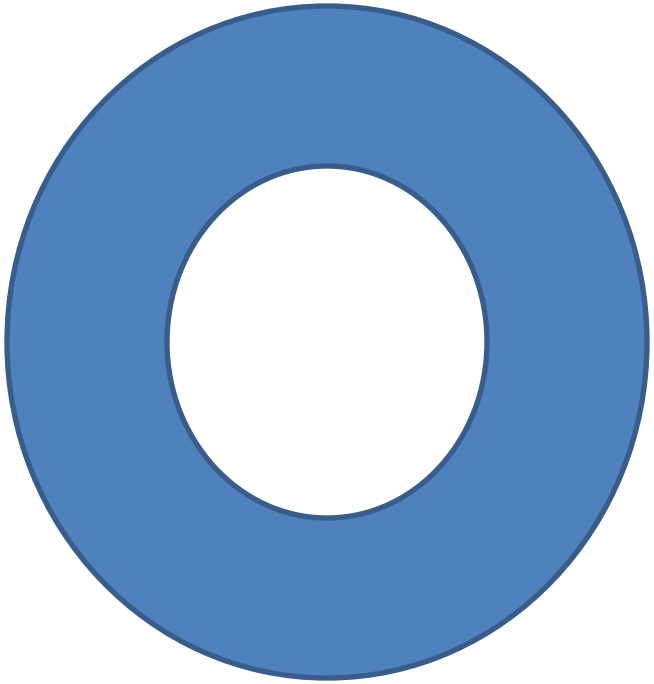
A L∞k At ∞'s????

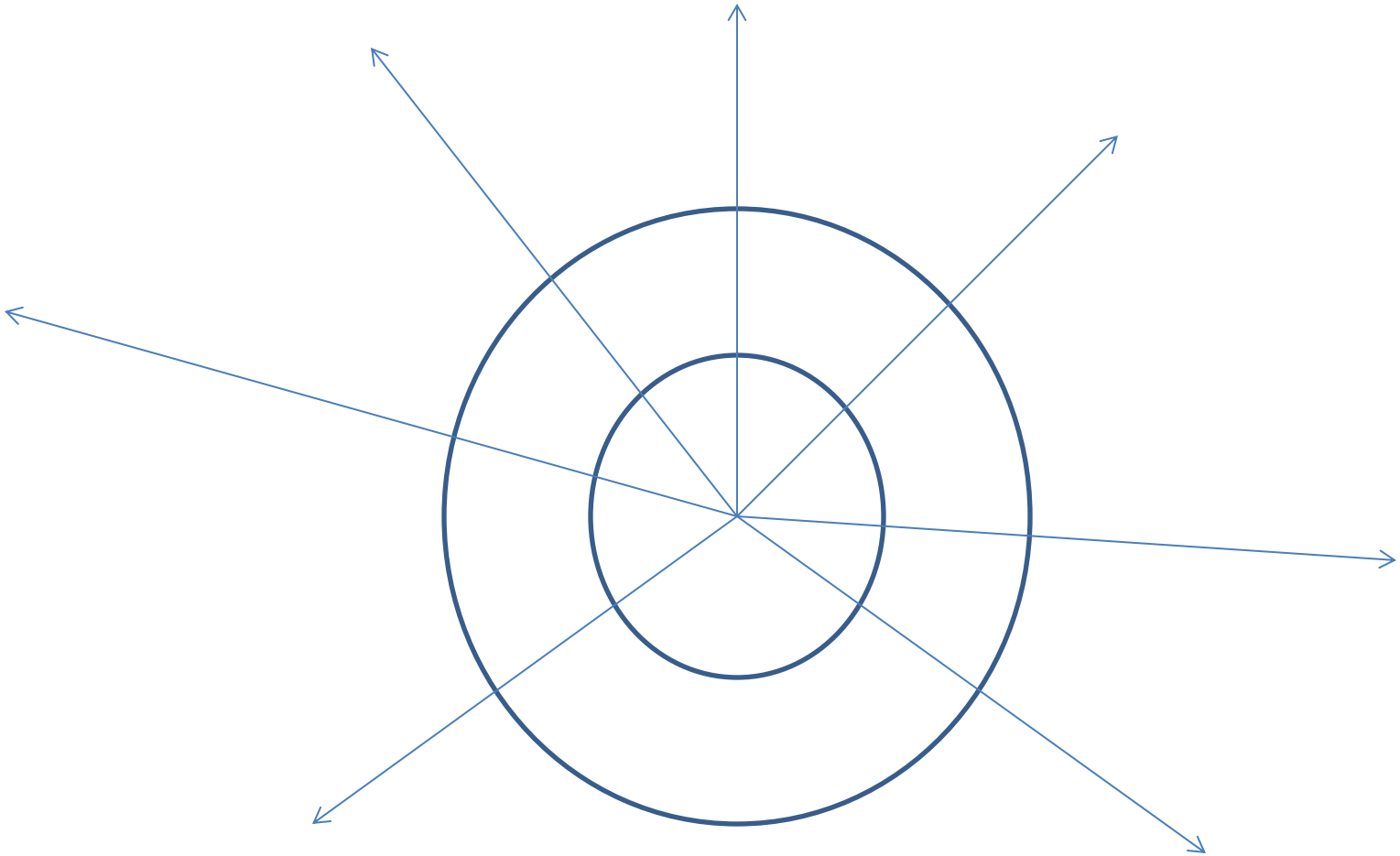
4 Parts

1. **Brain calisthenics.**
2. **1 to 1 correspondence (Aleph null ∞)**
3. **The trick to get the larger ∞ C null.**
4. **How to get an infinite # of ∞'s. (the Power Set)**

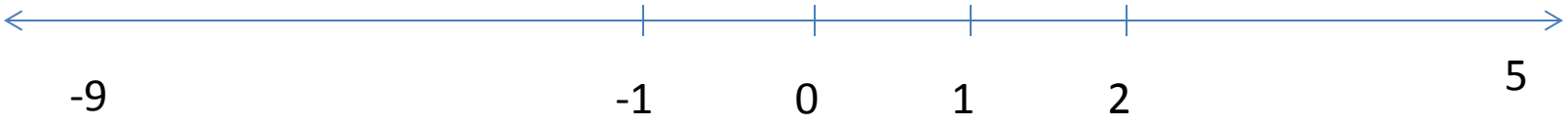
Which circle has more points on it, the inner circle or outer circle?



Which circle has more points on it, the inner circle or outer circle?
The idea if 1 to 1 correspondence, will every ray drawn from the center out go through one point on each circle? Can you draw a ray out that hits a point on the inner circle but not the outer circle? (Remember points have no size, only position.)

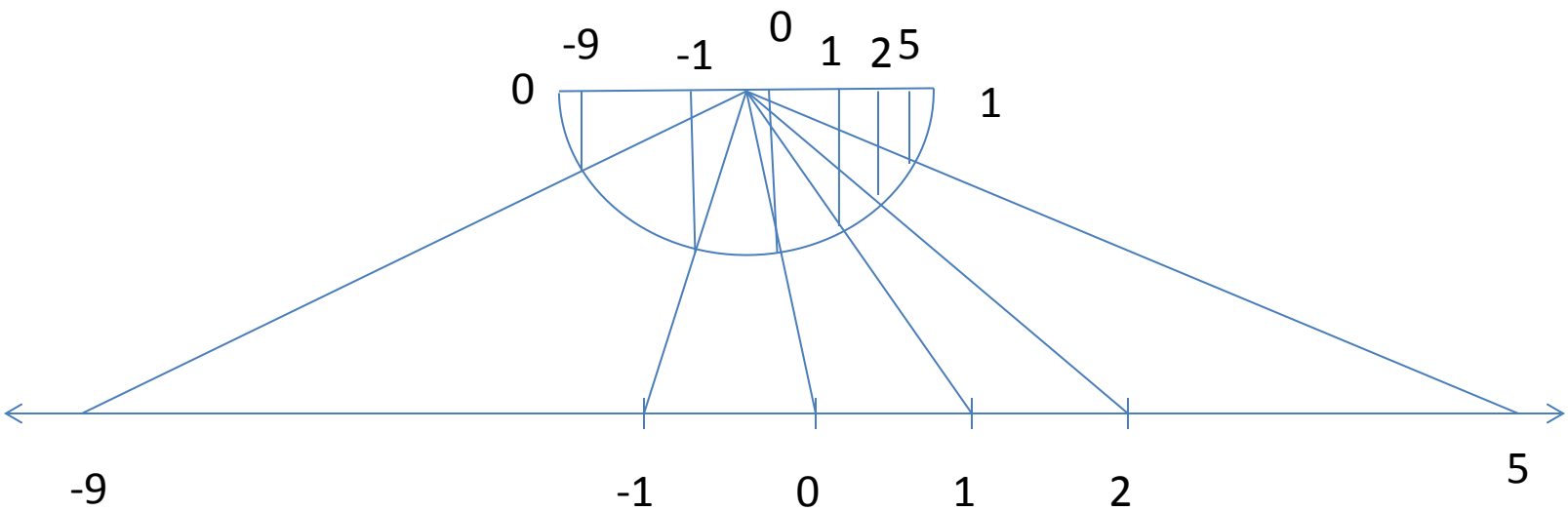


What has more points, the real number line or the line segment from 0 to 1. (Segment enlarged for understanding)



The Real Number Line

What has more points, the real number line or the line segment from 0 to 1?



The Real Number Line

If you make a semicircle under segment 0 to 1 and from any point on the real # line draw a line toward the center of the semicircle (any two points determine a straight line) but when you hit the semicircle detour perpendicular to line segment 0 to 1. For every point on the real # line you'll find a 1 to 1 correspondence with a point on the line segment from 0 to 1.

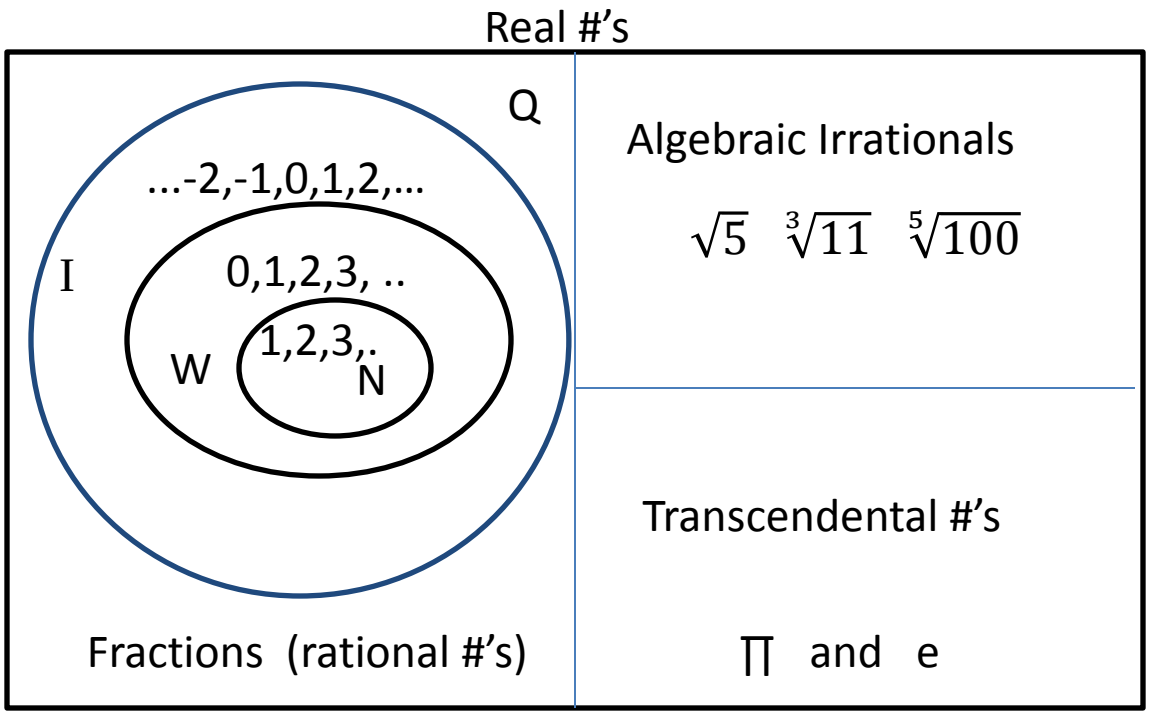
Part 2: 1 to 1 coorespondence

B.C. Sheep farmers could not count but did take a certain size pebble and place in a clay jar to represent a sheep in their herd.

For each pebble represented one sheep.

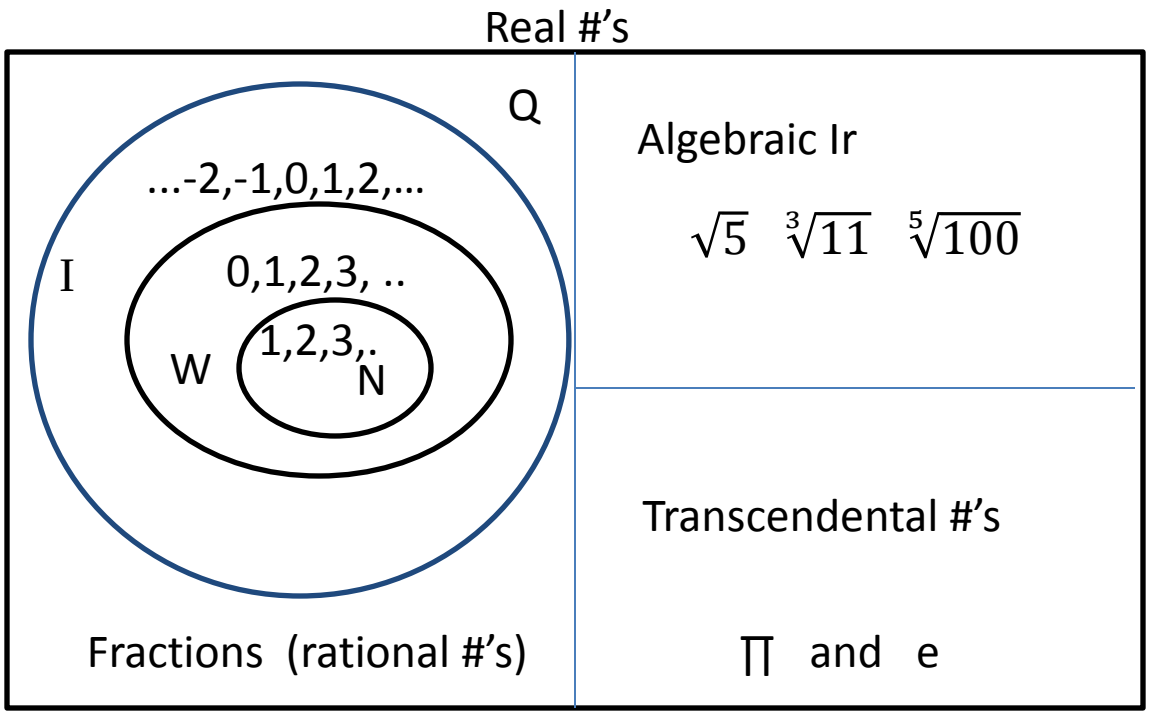
When they moved to a new pasture the would pour out their pebbles and place one back in the jar for each sheep that passed. After they all passed if two pebbles were left they knew two sheep were missing and sent someone to look for them.

When they met with a neighbor, they took their clay pot of pebbles with them so the neighbors could compare herds by the # of pebbles in each of their jars.



Natural #'s 1, 2, 3, 4, ... ∞ is the original Aleph null ∞ !

If you go to the Whole #'s and add zero to Aleph null ∞ do you have a larger ∞?

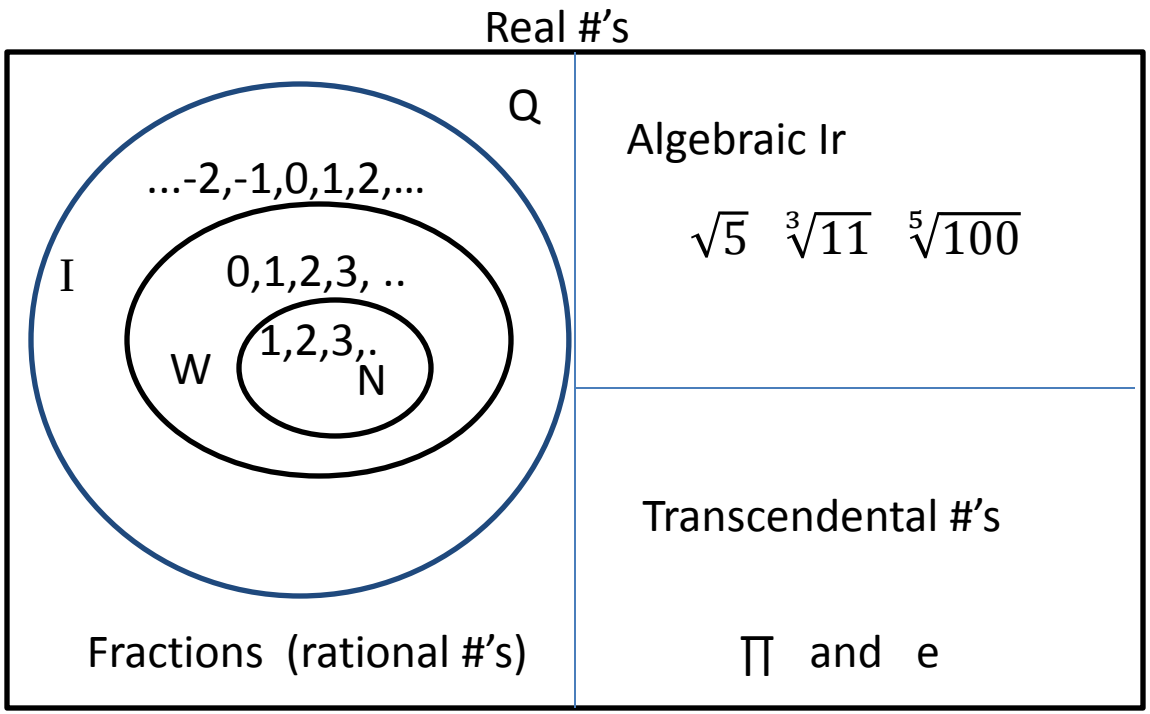


Natural #'s 1, 2, 3, 4, ... ∞ is the original Aleph null ∞ !

If you go to the Whole #'s and add zero to Aleph null ∞ do you have a larger ∞?

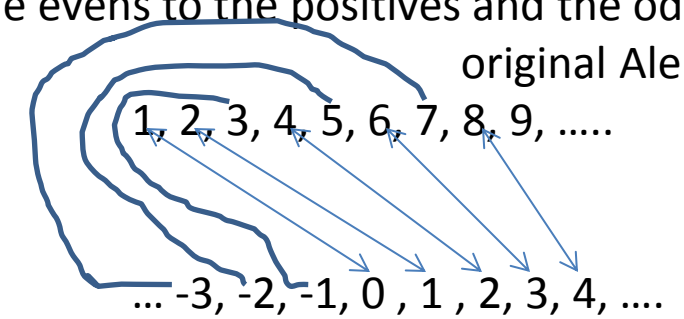
Can you set up a 1 to 1 correspondence? 1, 2, 3, 4, ...

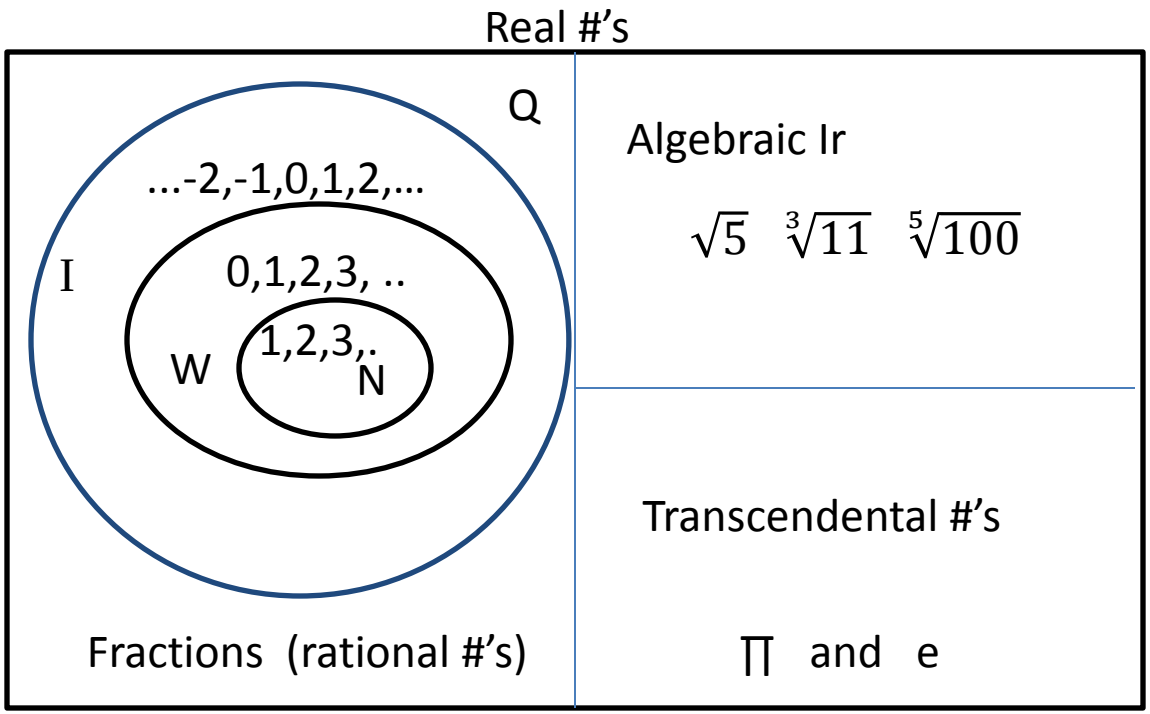
0, 1, 2, 3, 4, ...



Natural #'s 1, 2, 3, 4, ... ∞ is the original Aleph null ∞ !

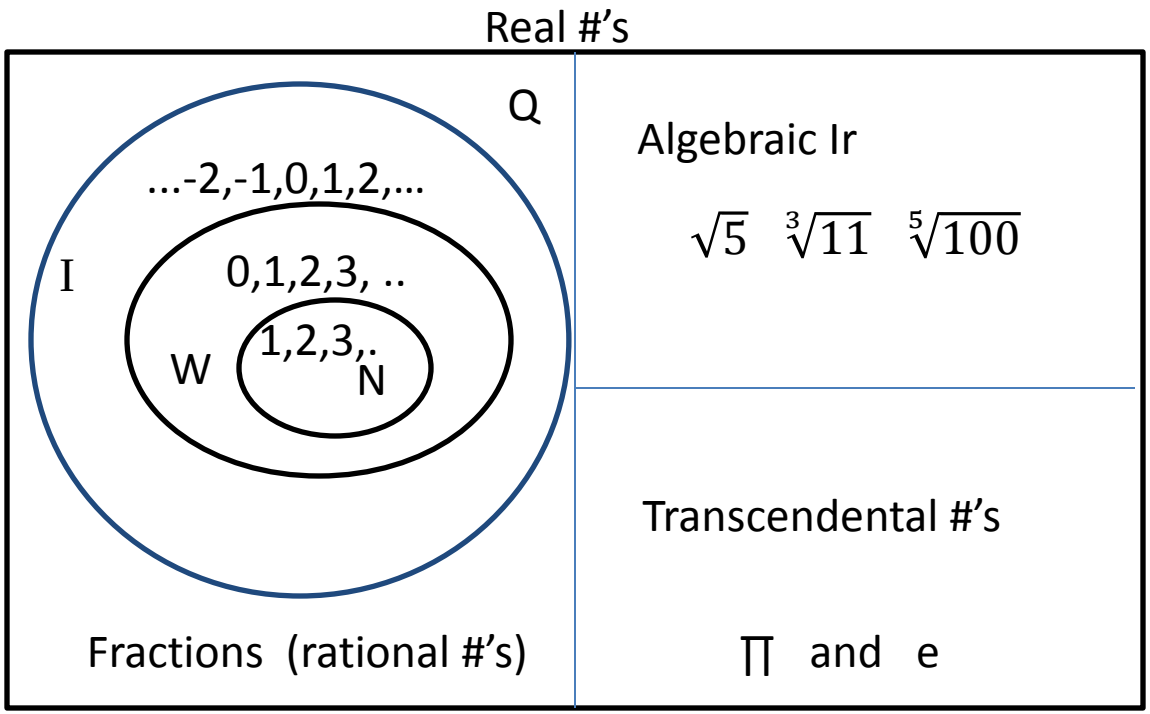
If you go to the Whole #'s and add a - ∞
(namely: -1,-2.-3.... - ∞; the integers) to Aleph null ∞ do you have a larger ∞? Hook the evens to the positives and the odds to the negatives so still original Aleph null ∞ !





Natural #'s 1, 2, 3, 4, ... ∞ is the original Aleph null ∞ !

If you go to the Whole #'s and add the infinite amount of ∞'s to it (namely all the fractions between each set of consecutive integers [between 0 & 1, between 1 & 2, etc.]; the rational #'s) now do you have a larger ∞?



	1	2	3	4	5	6	…
1	$\frac{1}{1}$	$\frac{2}{1}$	$\frac{3}{1}$	$\frac{4}{1}$	$\frac{5}{1}$	$\frac{6}{1}$	
2	$\frac{1}{2}$	$\frac{2}{2}$	$\frac{3}{2}$	$\frac{4}{2}$	$\frac{5}{2}$	$\frac{6}{2}$	
3	$\frac{1}{3}$	$\frac{2}{3}$	$\frac{3}{3}$	$\frac{4}{3}$	$\frac{5}{3}$	$\frac{6}{3}$	
4	$\frac{1}{4}$	$\frac{2}{4}$	$\frac{3}{4}$	$\frac{4}{4}$	$\frac{5}{4}$	$\frac{6}{4}$	
.							
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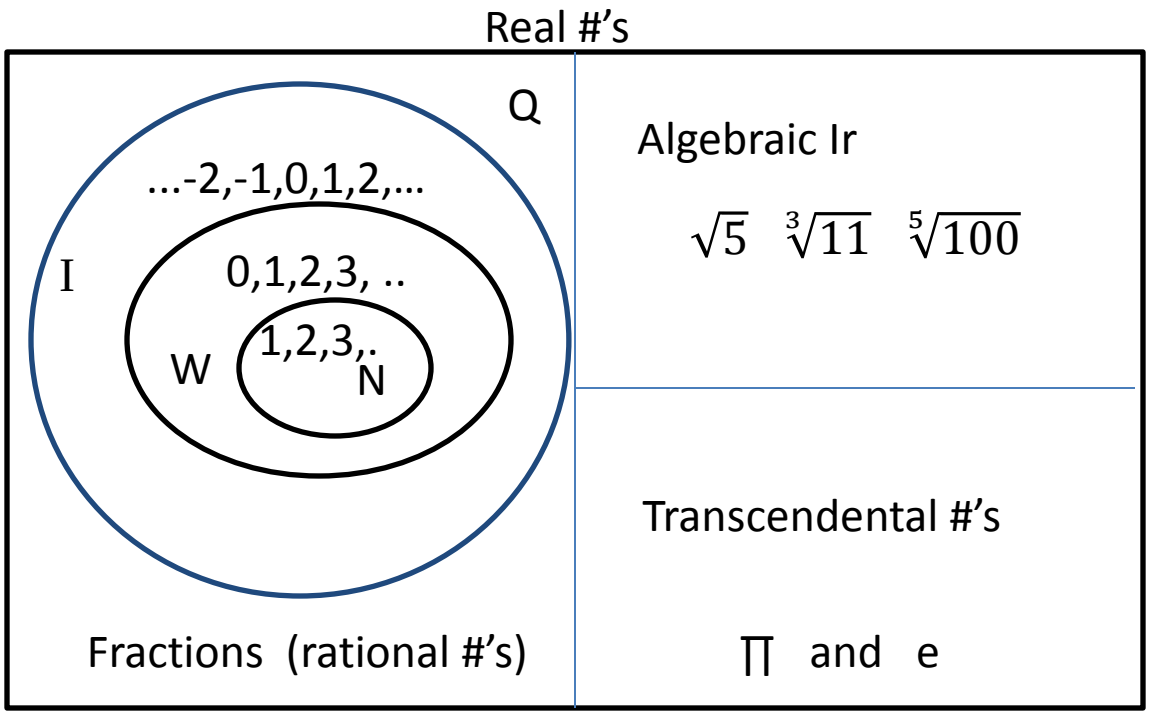
Natural #'s 1, 2, 3, 4, …. ∞ is the original Aleph null ∞ !

If you go to the Whole #'s and add the infinite amount of ∞'s to it (namely all the fractions between each set of consecutive integers [between 0 & 1, between 1 & 2, etc.]; the rational #'s) now do you have a larger ∞?

Now pick up all the fractions from the table in the upper right so you can write them out linearly as follows:

1/1 ½ 2/1 3/1 2/2 1/3 ¼ 2/3 3/2 4/1 5/1 4/2 3/3 2/4 … Cantor through out equivalent fractions like 2/2 = 1/1

1, 2, 3, 4, 5, 6, 7, 8, 9, …



Natural #'s 1, 2, 3, 4, …. ∞ is the original Aleph null ∞ !

Note: Cantor did something similar to the Rationals #'s (fractions) for the Algebraic Ir. Thus, the N, W, I, Q, and Alg. Ir are all the same size aleph null ∞ !!!!

Part 3: The trick to get a larger ∞ call C null!!!

Is the set of all real #'s a larger ∞ the aleph null?

Lets suppose you wrote down all the real #'s in decimal form in one column so that the terminating decimals like ¼ = .2500000000… ended in 0's forever.

Now remember that you have written every real # in your column! I can find a # not in your list!!!!

What is your favorite single digit # is? Let's say you answer 7
Then I tell you may favorite single digit # is 9 (It is!)
Now lets make a new decimal # by this rule: Take the first digit in row 1 (the 6) and if it is NOT a 7 we'll make it a 7 but if it is a 7 we'll make it a 9. We will continue are second digit of our new # but taking the 2nd digit in the second row then for the third digit – the third digit in the 3rd row etc. using our same rule. The new # in our example would be: 0.79777….

0.6 3 5 7 9 2 1 4 6 9 3 0 3 …
4.5 7 9 6 5 3 2 8 5 1 0 5 2 …
7.3 3 3 3 3 3 3 3 3 3 3 3 3 …
0.2 5 0 0 0 0 0 0 0 0 0 0 0 …
9.8 5 8 5 8 5 8 5 8 5 8 5 8 …

Now 0.79777… is not in our list because it differs from the 1st # by the 1st digit, by the 2nd # by the 2nd digit, by the 3rd # by the 3rd digit, etc.
Thus we cannot set up a 1 to 1 correspondence because we cannot list all real #'s thus real #'s are a larger infinity that Cantor called C null.

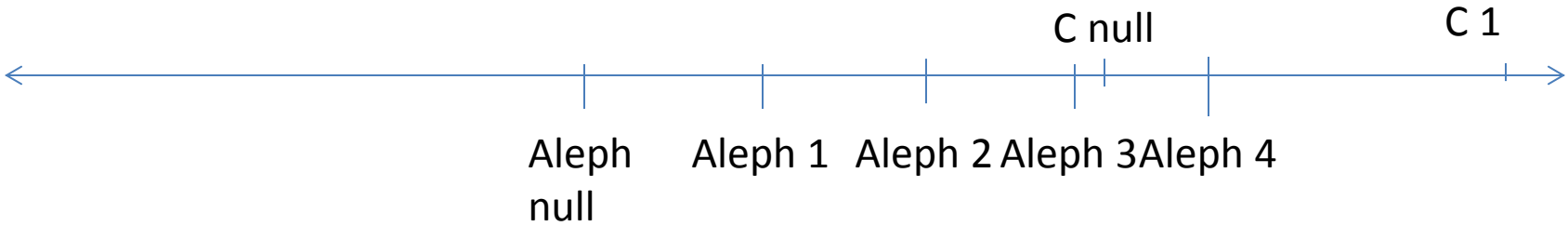
Part 4: How to get an infinite number of infinites? (The Power Set)

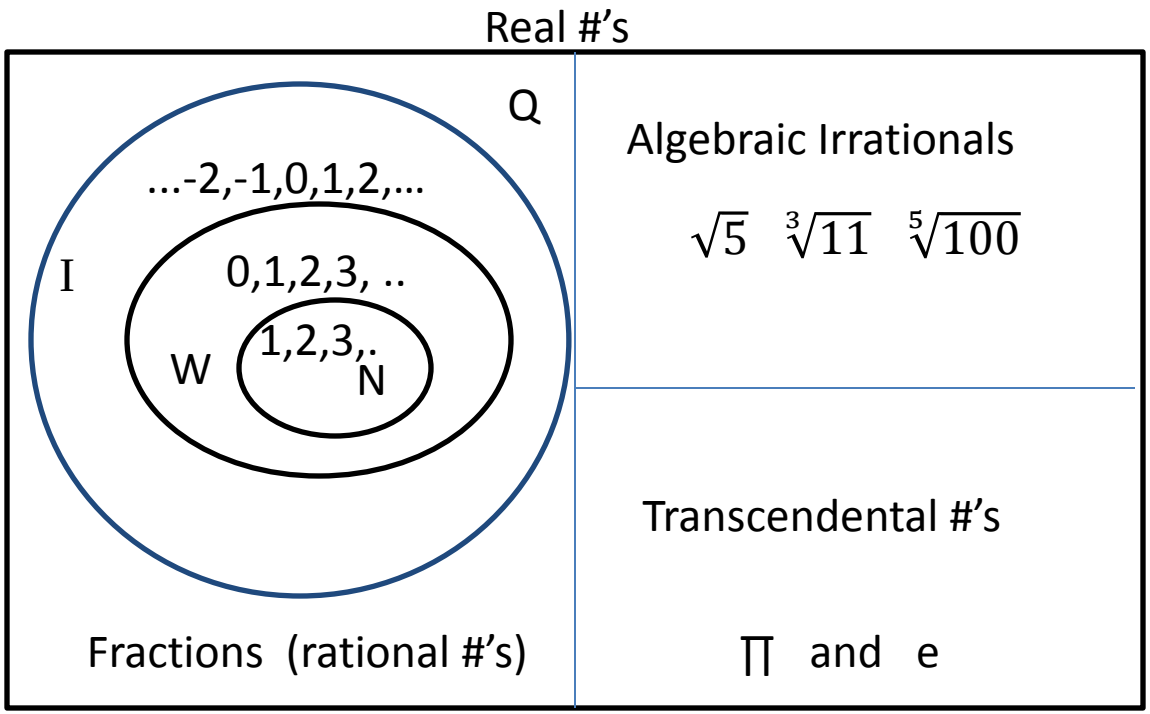
Cantor defined the power set to be all the possible subsets of any given set AND he noticed that the power set always has more members than the original set!

Example: If you had the set { 1, 2, 3} the power set would be {}{1}{2}{3}{1,2}{1,3}{2,3}{1,2,3}. Note the original set had 3 members but its power set has 8 members. 8 > 3 showing the power set always has more members!

Using the Power Set Cantor said the power set of aleph null is a larger infinity he called aleph 1 and the power set of aleph 1 he called aleph 2 etc.

Of course the power set of C null is C 1 and of C 1 is C 2 etc. All these are new infinities!!! He started designing a number line with infinities on it…





Note: Since N, W, I, Q, Alg. Ir are all aleph null infinity. (same size and countable with N)

But Real #'s are the uncountable C null infinity. So what subset of Real #'s is left that must cause this larger uncountable infinity?

That's right, the transcendental #'s are the uncountable C null infinity!

**If you read through the below websites AND watch the short you-tube video (middle below), you will have your life changed forever, for the better, in less time than it takes to watch an episode of the Big Bang Theory (even fast forwarding the commercials).

Note this site of the 15 most known transcendental #'s:
http://sprott.physics.wisc.edu/pickover/trans.html

And finally here is an interesting you-tube video, where in less than a Konichek dozen (14) minutes, a person gets you to understand transcendental #'s better and shows an easy proof why ∏ is transcendental. https://www.youtube.com/watch?v=seUU2bZtfgM

And finally read this short biography of the person who gets ALL the credit for the genius behind this powerpoint Georg Ferdinand Ludwig Philipp Cantor 3/3/1845-1/6/1918. http://www.daviddarling.info/encyclopedia/C/Cantor.html I just hope my short interpretation of his work does Dr. Cantor justice. THE BEGINNING!