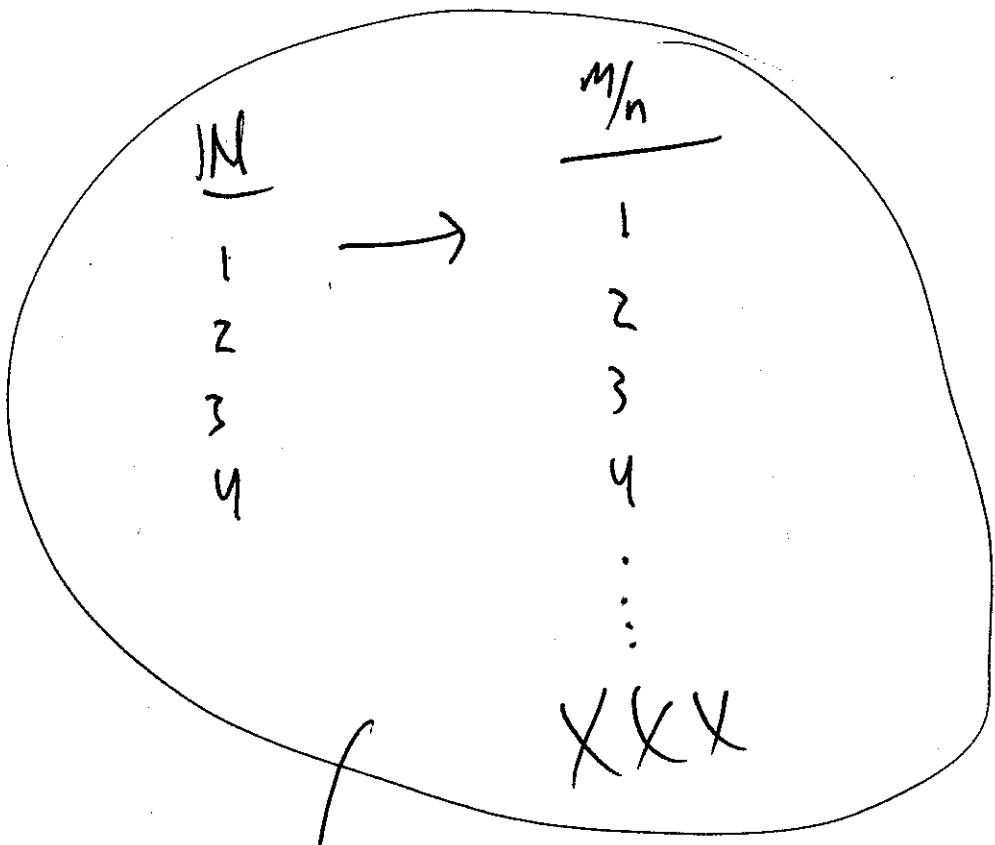


$n \backslash m$	1	2	3	4	...
1	1	$\frac{2}{1}$	$\frac{3}{1}$	4	...
2	$\frac{1}{2}$	1	$\frac{3}{2}$	2	...
3	$\frac{1}{3}$	$\frac{2}{3}$	1	$\frac{4}{3}$...
4	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	1	...

\mathbb{N}	$\frac{m}{n}$
1	1
2	$\frac{1}{2}$
3	2
4	$\frac{1}{3}$
5	3

L1



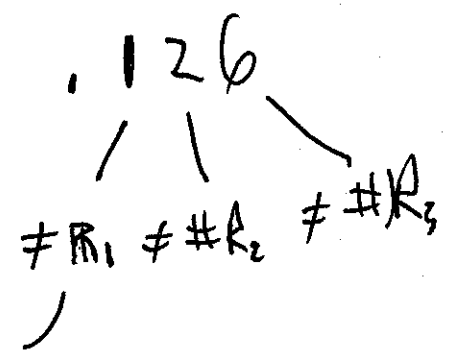
This correspondence won't work

\mathbb{R}

\mathbb{N}	\mathbb{R}
1	7.00
2	1.00
3	2.70

\mathbb{N}	\mathbb{R}
1	. 0 0 0
2	. 0 0 0
3	. 7 0 0

Consider the following #



the decimal value of \mathbb{R}_k at #1, position 1

\mathbb{R} is uncountable

"Proof by Diagonalization"

$$\Sigma_1 = \{0, 1\}$$

3

$$\Sigma_2 = \{a, b, c\}$$

N	Σ_2^*
1	ϵ
2	a
3	b
4	c
5	aa

Strings
are
Countable

languages are uncountable

$$A^* = \{ \epsilon, 0, 1, 00, 01, 10, 11, 000, \dots \}$$

$$A = \{ 1, 1, 1, 1, 1, \dots \}$$

$$\chi_A = \{ 0, 0, 1, 0, 1, 1, 0, 1, \dots \}$$

Characteristic function

$$L(A) = \{ \text{binary strings with odd \# of 1s} \}$$

\mathbb{N}	all languages								
1	0	0	1	0	1	1	0	1	...
2	0	1	0	1	1	0	0	0	...

Using diagonalization, it can be shown that ~~the~~ languages are uncountable

Since TMs are countable, there must be some undecidable languages!

For example, A_{TM} is undecidable