CSL 101 DISCRRETE MATHEMATICS

LECTURE 2

Dr. Barun Gorain
Department of CSE, IIT Bhilai
Email: barun@iitbhilai.ac.in

SOME MORE FACT ON COUNTABILITY

Theorem 1: Let A and B be two countably infinite sets. Then A U B is countable.

- Given A is countable. This implies there exists a bijection from f: $\mathbb{N}$ -> A.
- Given B is countable. This implies there exists a bijection from g: $\mathbb{N}$ -> B.
- **To prove** there exists a bijection from h: $\mathbb{N}$ -> A U B

SOME MORE FACT ON COUNTABILITY

Theorem 2: Let A be a countably infinite set, and B an infinite subset of A. Then B is countable.

Exercise

SOME MORE FACT ON COUNTABILITY

Theorem: $\mathbb{N} \times \mathbb{N}$ **is countable**

- Define a function f: $\mathbb{N} \times \mathbb{N} \rightarrow \mathbb{N}$ as follows:
  - $f(m,n)=2^m 3^n$

Now use the previous theorem to prove this

SOME MORE FACT ON COUNTABILITY

Theorem: The set of rational number $\mathbb{Q}$ is countable

Can we use now the previous theorem to prove this?

UNCOUNTABLE SET

Theorem: The set of real numbers R is uncountable.