

Algorithm: generate prime numbers

$p = 2, p = 1, p = p + 2 \rightarrow 2, 1, 3, 5, 7, \dots$

(above algorithm is wrong, attempts to use inductive reasoning instead of deductive)

Computer science uses deductive reasoning (proofs)

Outline:

- Discrete objects
  - concepts/concrete
  - proofs/theory/abstract
  - theory of computation
- Reasoning about discrete objects
- Counting discrete objects
- Randomness and probability
- What can we compute?

minimum element in the set  $\{8, 9, 3, 10, 19\}$   $\min = 3$

minimum element in the set  $\{\frac{1}{k} | k \in \mathbb{N}\} \leftarrow \mathbb{N} = \{1, 2, 3, \dots\}$   
has no minimum

2-contact ebola on a grid

A square gets infected if 2 or more neighbors (N,S,E,W) are infected

Dominoes:

2 sides, each with 1-6 pips

Question: give you a sequence of dominoes. You can invert an arbitrary number of them. Your goal is to make all top halves the same numbers. Is this possible?