



# Dominating Set (Proof Sketch)

#### Steps:

- 1) Show that Dominating-set  $\in$  NP.
- Show that Dominating-set is not easier than a NPC problem
  - We choose this NPC problem to be Vertex cover
  - Reduction from Vertex-cover to Dominating-set
- 3) Show the correspondence of "yes" instances between the reduction



























## Practice

### (KT Ch. 8, Problem 3)

Suppose you're helping to organize a summer sports camp, and the following problem comes up. The camp is supposed to have at least one counselor who's skilled at each of the *n* sports covered by the camp (baseball, volleyball, etc.). They have received job applications from *m* potential counselors. For each of the *n* sports, there is some subset of the m applicants qualified in that sport. The question is: For a given number k < m, is is possible to hire at most *k* of the counselors and have at least one counselor qualified in each of the *n* sports? We'll call this the *Efficient Recruiting Problem*.

Show that the *Efficient Recruiting Problem* is NP-Complete.

### So your problem is NP-Complete? Now What?

Important: NP-Completeness is not a death sentence, but you need appropriate expectations/strategies

Some Useful Strategies

- 1. Brute-Force (for small input sizes)
- 2. Heuristics Fast algorithms that are not always correct
- 3. Solve in exponential time but faster than brute-force search
- 4. Approximation Algorithms



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