

CIS 160

## Recitation Guide - Week 5

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**Topics Covered:** Strong Induction, Pigeonhole Principle, Probability

**Problem 1:**

Consider any five points  $P_1, \dots, P_5$  in the interior of a square of length 2. Show that at least two of the points must be at a distance of at most  $\sqrt{2}$  apart.

**Problem 2:**

A car needs 1 unit of length to park while a truck needs 2 units of length. Assume that cars are indistinguishable and so are trucks. How many distinct car/truck parking patterns are possible along an  $n$  unit long sidewalk? Prove your result.

**Problem 3:**

Compute the probability of the event “when we roll  $n$  (distinguishable) fair dice, any  $k$  of the dice show the same number while the other  $n - k$  show numbers different from the one shown by the  $k$  dice.” Assume  $n \geq 3$  and  $\frac{n}{2} < k < n$ .