Reading Questions 14

page 200 Principle 6.3.1

page 200 Problem 11

1. If n objects are put into m boxes and $n > m$, then at least one box contains at least 2 objects.

2. In problem 11, the squares are the objects and the points are the boxes.

3. In problem 11, why is the length of the diagonal equal to $\sqrt{2}$?

Section 6.3 The Pigeonhole Principle (Part 1)

More Counting Problems

P 1. How many three-digit numbers contain the digits 2 and 5?

P 2. Let $A = \{1, 2, \ldots, n\}$ and $B = \{1, 2\}$. Show that there are 2^n functions from A to B.

Existence Problems

P 3. There are 15 students in a discrete math class. Show that there are at least 2 students that have birthdays in the same month. In this problem what are the Pigeons and what are the holes?

P 4. Show that among $n + 1$ arbitrarily chosen integers, there must exist two whose difference is divisible by n.

P 5. Thirty buses are to be used to transport 2000 students from South Hadley to Amherst. Each bus has 80 seats. Assume one seat per passenger.

1. Prove that one of the buses will carry at least 67 passengers.

2. Prove that one of the buses will have at least 14 empty seats.