Combinatorics HW Assignment #1 (Pigeonhole Principle)

Practice Problems (Not to hand in): p. 9, # 1, 3, 6(a), 10, 13

Problems That Count (To hand in):
1. (a) Suppose Michael swam a total of 18 races over 13 consecutive days, with at least one race every day. Prove that there must have been a span of consecutive days during which Michael swam in exactly 7 races.
   (b) Is the statement in (a) true if 18 is replaced by 19? Prove or disprove.
   (c) Is the statement in (a) true if 18 is replaced by 20? Prove or disprove.

AND

Bonà, p. 11, # 15, 17, 20, 22

Bonus Problem (Extra Credit): Prove that given any five points on a sphere, there is a closed hemisphere that contains at least four of them. [A great circle of a sphere is a circle on the sphere whose center is the same as the center of the sphere. A closed hemisphere is a great circle on a sphere, together with all of the points on the sphere that lie on one side of the great circle.]

HW Set #1 is due at the beginning of class on Monday, August 25. Please be prompt.