

Name & UID: _____

Circle Your Section!			
0101 (10am: 3120, Ladan)	0102 (11am: 3120, Ladan)	0103 (Noon: 3120, Peter)	
0201 (2pm: 3120, Yi)	0202 (10am: 1121, Vikas)	0203 (11am: 1121, Vikas)	0204 (9am: 2117, Karthik)
0301 (9am: 3120, Huijing)	0302 (8am: 3120, Huijing)	0303 (1pm: 3120, Yi)	250H (10am: 2117, Peter)

Question:	1	2	3	Total
Points:	20	40	40	100
Score:				

1. (20 points) Let $P = \{2, 3, 5, 7, 11, 13, 17, 19\}$ be the set of primes less than 20.
 - (a) Use the Pigeon Hole Principle to show that there exist at least four different subsets of P that all sum to the same value.
 - (b) Show how to refine your proof to show that there exist at least five different subsets of P that all sum to the same value.

2. (40 points) A group of students contains five men and six women.
- (a) How many seven-player soccer teams can you form with three men and four women?
 - (b) How many different lines can be formed using any two of the men and any three of the women?
 - (c) How many different lines can be formed using any two of the men and any three of the women if all of the women must be next to each other?
 - (d) The six women pair up into teams of two. How many pairings are possible?

- (e) Hats are given out to some (or none or all) of the men. How many ways are there to do this?
- (f) I leave some number of hats in a bin and the women take all of them. How many hats do I need to leave in the bin before I know that some woman has at least 4?
- (g) I go to the store to buy hats for the eleven students. Hats come in four colors: red, blue, green, and yellow. How many different ways can I buy hats?
- (h) How many different ways can I buy the hats, if I have to buy at least one hat of each color?

3. (40 points) Suppose you have a 54 card deck the contains the 52 usual cards and two jokers. The jokers are wild cards - they can represent any card of the players choosing.
- (a) How many five-card hands form four-of-a-kind without using a joker. Note that such a hand may not contain a joker (since the hand would be considered five-of-a-kind).

- (b) How many five-card hands form four-of-a-kind using exactly 1 joker. Note that such a hand may not contain two jokers (since the hand would be considered five-of-a-kind).

(c) How many five-card hands form four-of-a-kind using both jokers?

(d) How many five-card hands do *not* form four-of-a-kind?