
Math 4363 - Combinatorics
Practice Problems - Ch 6.1-6.5 Inclusion/Exclusion

1. Find the number of integers between 1 and 10,000 inclusive that are not divisible by either 4, 5 or 6.

2. Find the number of integers between 1 and 10,000 inclusive that are neither perfect squares nor perfect cubes.

3. Determine the number of 10-combinations of the multiset

$$S = \{\infty \cdot a, 4 \cdot b, 5 \cdot c, 7 \cdot d\}.$$

4. Determine the number of integral solutions of the equation

$$x_1 + x_2 + x_3 + x_4 = 20$$

that satisfy

$$1 \leq x_1 \leq 6, 0 \leq x_2 \leq 7, 4 \leq x_3 \leq 8, 2 \leq x_4 \leq 6.$$

5. Determine the number of permutations of $\{1, 2, \dots, 8\}$ in which no even integer is in its natural position.

6. Determine the number of permutations of $\{1, 2, \dots, 8\}$ in which exactly four integers are in their natural positions.

7. At a party, seven people check their hats into the cloakroom. In how many ways can their hats be returned so that

- (a) no one receives his/her own hat?
- (b) at least one person receives their own hat?
- (c) at least two people receive their own hats?

8. Determine the number of ways to place 6 non-attacking indistinguishable rooks on each of the following 6-by-6 boards where forbidden positions are marked with an 'X'.

a)

X	X				
		X	X		
				X	X

b)

X	X				
X	X				
		X	X		
		X	X		
				X	X
				X	X

c)

X	X				
	X	X			
		X			
				X	X
					X