## 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

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

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

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