Choose three problems only from these five.

1. (5-8 points) How many integers in [123] are relatively prime to 10?

2. (5-10 points) How many permutations of length $n$ contain exactly two 1-cycles?

3. (5-10 points) How many $2 \times 2$ matrices are there with entries from the set \{0, 1, 2, 3\} that contain no 0-rows and no 0-columns?

4. (5-10 points) What is the number of integral solutions of the equation $x_1 + x_2 + x_3 = 15$ that satisfy $0 \leq x_1 \leq 5$, $0 \leq x_2 \leq 7$, $0 \leq x_3 \leq 10$?

5. (5-12 points) What is the number of integral solutions of the equation $x_1 + x_2 + x_3 + x_4 + x_5 = 50$ that satisfy $5 \leq x_i \leq 15$ for $i = 1, 2, 3, 4, 5$?