

Name: \_\_\_\_\_

**Directions:** Show all work. No credit for answers without work. Unless specifically asked for a numerical answer, you may leave your answers in terms of exponentials, factorials, permutation numbers, and binomial coefficients.

1. [4 points] Determine the number of non-negative integral solutions to the following.

(a)  $x_1 + x_2 + x_3 + x_4 + x_5 + x_6 = 80$ , with  $x_3 \geq 8$ .

(b)  $x_1 + x_2 + x_3 + x_4 + x_5 + x_6 = 80$ , with  $x_3 \geq 8$  and  $x_5 \leq 50$ .

2. [3 points] A company wishes to order  $s$  sandwiches for their annual party from a menu that lists  $k$  types of sandwich. How many ways are there for the company to complete its order?

3. [3 points] Find  $\mathcal{P}(\{1, 2, 3\})$ .