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. [**2 points**] Evaluate $\binom{8}{4}$ numerically.

2. The DMV offers a 10 question multiple choice test. Each question has 4 choices, consisting of 1 correct choice and 3 incorrect choices. All questions must be answered.

   (a) [**2 points**] How many ways are there to complete the test?

   (b) [**2 points**] To pass, at least 7 questions must be answered correctly. How many ways are there to pass the test?

3. Let n be a positive integer.

   (a) [**2 points**] Express $\binom{n}{0} + 3\binom{n}{1} + 3^2\binom{n}{2} + \cdots + 3^n\binom{n}{n}$ using sigma notation.

   (b) [**2 points**] Evaluate the sum. Justify your answer.