Name: _____

1. [**2 points**] A job advertisement attracts 67 applicants. Of the applicants, a total of 29 have work experience, 16 have an advanced degree, 8 have corporate contacts, 7 have work experience and an advanced degree, 3 have an advanced degree and corporate contacts, 3 have work experience and corporate contacts, and 1 person has all three favorable attributes. How many applicants possess none of the three favorable attributes?

2. [**2 points**] Find the exact numerical value of $C(11, 4)$ (also known as $\binom{11}{4}$).

3. [**2 points**] How many non-negative integer solutions are there to the equation

$$x_1 + x_2 + x_3 + x_4 = 50?$$

For example, there are four solutions where one of the variables is 50 and the rest are 0. You may leave your answer in terms of permutation numbers (e.g. $P(n, r)$), binomial coefficients (e.g. $C(n, r)$), and factorials (e.g. $n!$).

4. [**2 points**] Find the coefficient of x^7 in $(7x - 2)^{23}$. You may leave your answer in terms of permutation numbers (e.g. $P(n, r)$), binomial coefficients (e.g. $C(n, r)$), and factorials (e.g. $n!$).

5. [**2 points**] Give an example of a relation on $\{1, 2, 3\}$ that is reflexive, symmetric, and <u>not</u> transitive.

6. [**1 bonus point**] A 6×6-board with is tiled with 2×1 dominos. Prove that it is possible to divide the board in two pieces along a vertical or horizontal line without cutting any of the dominos.