Name: _____

Directions: Show all work.

1. **[5 points]** Use the binomial theorem to find a closed-form formula for $\sum_{k=0}^{n} k2^k \binom{n}{k}$.

2. **[5 points]** A party has a total of $3n$ people, with n single people and $2n$ people in n couples. Find a summation formula for the number of ways to select n people such that each couple has at most 1 selected person.