1. Let \( \ell_1, \ldots, \ell_k \) be some nonnegative numbers such that \( \ell_1 + \cdots + \ell_k = \ell \). Find the number of weak compositions (in terms of \( \ell, k, \) and \( n \)) \( (a_1, \ldots, a_k) \) of \( n \) into \( k \) such that \( a_i \geq \ell_i \).
2. Let $n$ be a natural number.
   
   (a) Find an explicit formula for $S(n, n - 2)$.

   (b) Find an explicit formula for $S(n, 3)$. 
3. How many numbers must be selected from the set \([6]\) to guarantee that at least one pair of these numbers add up to 7?
4. Show that \( \int_{0}^{\infty} x^n e^{-x} \, dx = n! \) for all \( n \geq 0 \).