1. The 10 students in a certain tutorial group each hand in an assignment. These are given to 3 markers. In how many ways can this be done?

2. You have a deck of fifty-two cards.
   (a) How many ways are there of choosing a hand of five cards?
   (b) How many of them contain the queen of hearts?
   (c) In how many ways can four hands of five cards each be given to four players?
   (d) In how many ways can four hands of five cards be selected from the deck?

3. Consider the set \( \{a, b, c, d, e, f\} \). How many ways are there of choosing a set of four letters from this set
   (a) if no letter is chosen twice?
   (b) if repetitions are allowed?

4. Given finite sets \( A \) and \( B \), let \( E \) be a subset of \( A \times B \). For \( a \in A \), let
   \[ E(a) = \{ b \in B \mid (a, b) \in E \} \]
   and for \( b \in B \), let
   \[ E^\triangledown(b) = \{ a \in A \mid (a, b) \in E \} \].
   Prove that
   \[ \sum_{a \in A} |E(a)| = \sum_{b \in B} |E^\triangledown(b)|. \]

5. Find a formula for the number of solutions of \( x_1 + \cdots + x_n \leq m \), where \( x_i \in \mathbb{N} \) for \( n, m \in \mathbb{N} \).

6. (a) Expand \( (x_1 + x_2 + x_3)^4 \).
   (b) What is the coefficient of \( x_1^2 x_2^3 x_3^2 \) in \( (x_1 + x_2 + x_3)^7 \)?

7. How many words of 14 letters can one form from the letters of the word

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1. By counting in “two ways” the number of solutions to
\[ x_1 + x_2 + \cdots + x_n \leq m, \]
where the \( x_i \) are non-negative integers, prove the binomial identity
\[ \binom{n-1}{0} + \binom{n}{1} + \cdots + \binom{m+n-1}{m} = \binom{m+n}{m}. \]

2. Show that the number of integer solutions of the equation
\[ 2x_1 + 3x_2 + 5x_3 = 20 \]
in which \( 0 \leq x_1 \leq 5, \ 0 \leq x_2 \leq 4, \ 0 \leq x_3 \leq 4 \) is the coefficient of \( t^{20} \) in
\[ (1 + t^2 + t^4 + t^6 + t^8 + t^{10})(1 + t^3 + t^6 + t^9 + t^{12})(1 + t^5 + t^{10} + t^{15} + t^{20}). \]
Determine this number.