Problem 1. Is $\{\{1\},\{2,3\},\{5\}\}$ a partition?
A) Yes B) No C) Of what?

Problem 2. How many partitions are there of the empty set?
A) 0 B) 1 C) ∞ D) The answer is not defined.

Problem 3. How many distinct rearrangements are there of the letters of my name, JONATHAN?
A) 1 B) 8 C) $2 \times 7!$ D) $8!$ E) None of these

Problem 4. Let n be a positive integer. Compute

$$\sum_{k=0}^{n}(-1)^k\binom{n}{k} = \binom{n}{0} - \binom{n}{1} + \binom{n}{2} - \cdots + (-1)^n\binom{n}{n}.$$

A) $\binom{n}{n/2}$ B) $-\binom{n}{n/2}$ C) 0 D) Depends on n.

Problem 5. Let S be a finite set. Which is greater?

A) The number of partitions of S.
B) The number of equivalence relations on S.
C) They are equal.
D) The answer depends on S.

Problem 6. Let S be a set with n elements. How many ways are there to partition S into *two* subsets.
A) 1 B) n C) $2^n - 2$ D) 2^n E) None of these

Problem 7. Let S be a set with n elements and let a, b, and c be three positive integers with $a+b+c=n$. You may assume that a, b, and c are all different numbers. Devise a formula using addition, subtraction, multiplication, division, exponentiation, and the factorial for the number of partitions of S into three subsets of sizes a, b, and c.

Problem 8. How does your formula from the last problem change when $a = b \neq c$? What about when $a = b = c$?