Choose effective notation

**Problem 1.** In a town, 2/3 of the men are married to 3/4 of the women. What fraction of the adult population is married?

**Problem 2.**  

a) An automobile went up a hill at a speed of 30 miles per hour, and returned downhill at a speed of 50 miles per hour. What was the average speed for the round trip?

b) If the automobile went uphill at an average speed of 10 miles per hour, how fast it would have to go downhill to make the average speed for the round trip 20 miles per hour?

**Problem 3.** (Homework) The hands of a clock are together at 12 noon. At what time in the afternoon will they next be together?

**Problem 4.**  

a) If \( n \) is a positive integer such that \( 2n + 1 \) is a perfect square, show that \( n + \) is the sum of two consecutive perfect squares.

b) If \( 3n + 1 \) is a perfect square, show that \( n + 1 \) is the sum of three perfect squares.

**Problem 5.** Let \(-1 < a_0 < 1\) and define recursively \( a_n = \sqrt{\frac{1 + a_{n-1}}{2}} \), \( n > 0 \). Let \( A_n = 4^n(1 - a_n) \). What happens to \( A_n \) as \( n \) tends to infinity?

**Problem 6.** You are given a cup of coffee and a cup of cream, each containing the same amount of liquid. A spoonful of cream is taken from the cup and put into the coffee cup, then a spoonful of the mixture is put back into the cream cup. Is there now more or less cream in the coffee cup than coffee in the cream cup?

**Problem 7.** Find the sum of the reciprocals of all the positive divisors of 144.

**Problem 8.** Solve the equation \( \sqrt{x} + \sqrt{y-1} + \sqrt{z-2} = \frac{x+y+z}{2} \).

**Problem 9.** Evaluate the following
\[
\frac{\prod_{n=1}^{2000} (n \cdot (n+3) + 2)}{(1 \cdot 4 + 2)(3 \cdot 6 + 2)(5 \cdot 8 + 2)\ldots(2001 \cdot 2004 + 2)}
\]