www.artofproblemsolving.com/community/c3236083
by parmenides51

1   In the figure shown, the small circles have radius 1. Calculate the area of the gray part of the figure.
https://1.bp.blogspot.com/-oy-WirJ6u9o/XzcFc3roVDI/AAAAAAAAMX8/qxNy5I_0RWUOxl-ZE52fnrwo0
s0/1998%2BMohr%2Bp1.png

2   For any real number m, the equation

$$x^2 + (m-2)x - (m+3) = 0$$

has two solutions, denoted x_1 and x_2. Determine m such that $x_1^2 + x_2^2$ is the minimum possible.

3   The points lie on three parallel lines with distances as indicated in the figure A, B and C such that square $ABCD$ is a square. Find the area of this square.
https://1.bp.blogspot.com/-xeFvahqPVyM/XzcFfB0-NfI/AAAAAAAAMYA/SV2XU59uBpo_K99ZBY43KSSOKe
s0/1998%2BMohr%2Bp3.png

4   Let a and b be positive real numbers with $a + b = 1$. Show that

$$\left(a + \frac{1}{b}\right)^2 + \left(b + \frac{1}{b}\right)^2 \geq \frac{25}{2}.$$

5   A neat fruit arrangement on a large round dish is edged with strawberries. Between 100 and 200 berries are used for this border. A deliciously hungry child eats first one of the strawberries and then starts going round and round the dish, she eats strawberries in the following way: When she has eaten a berry, she leaves it next lie, then she eats the next, leaves the next, etc. Thus she continues until there is only one strawberry left. This berry is the one that was lying right after the very first thing she ate. How many berries were there originally?