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**Problem 1** Let  $n \geq 3$  be a natural number. For a set  $S$  of  $n$  real numbers,  $A(S)$  denotes the set of all strictly increasing arithmetic sequences of three terms in  $S$ . At most, how many elements can the set  $A(S)$  have?

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**Problem 2** Suppose that there is a point  $S$  inside a quadrilateral  $ABCD$  such that segments  $SA, SB, SC, SD$  divide the quadrilateral into four triangles of equal areas. Prove that one of the diagonals of the quadrilateral bisects the other one.

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**Problem 3** Let  $a, b$  be nonnegative integers. Prove that  $5a > 7b$  if and only if there exist nonnegative integers  $x, y, z, t$  such that

$$\begin{aligned}x + 2y + 3z + 7t &= a, \\y + 2z + 5t &= b.\end{aligned}$$

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