MATHEMATICS MAGAZINE PROBLEM

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Abstract. [**1750**] Let $p > 3$ be prime. Define a sequence of integers x_1, x_2, x_3 to be a 3-*progression* if they are in arithmetical progression modulo p. If $A_1, \ldots, A_k \subseteq \mathbb{Z}/p\mathbb{Z}$ are such that each 3-progression is contained in some A_i, call the collection $\{A_1, \ldots, A_k\}$ a 3-*covering* of $\mathbb{Z}/p\mathbb{Z}$. Find the minimum of over all 3-coverings of the quantity:

$$\sum_{i=1}^{k} |A_i|^2.$$

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