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**P1** Prove that there exist infinitely many pairs of different positive integers $(m, n)$ for which $m!n!$ is a square of an integer.

*Proposed by Anton Trygub*

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**P2** Let $H$ be orthocenter of an acute $\Delta ABC$, $M$ is a midpoint of $AC$. Line $MH$ meets lines $AB, BC$ at points $A_1, C_1$ respectively, $A_2$ and $C_2$ are projections of $A_1, C_1$ onto line $BH$ respectively. Prove that lines $CA_2, AC_2$ meet at circumscribed circle of $\Delta ABC$.

*Proposed by Anton Trygub*

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**P3** Find all functions $f : \mathbb{R} \to \mathbb{R}$ such that for any real $x, y$ holds equality

$$f(xf(y)) + f(xy) = 2f(x)y$$

*Proposed by Arseniy Nikolaev*

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