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On some congruence conjectures modulo p^2

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Abstract. In this paper, we mainly obtain a congruence which contains a conjecture of Z.-W. Sun. For any prime $p > 3$, we have

$$\sum_{n=0}^{p-1}\left(\sum_{k=0}^{n}\binom{n}{k}\frac{\binom{2k}{k}}{2^k}\right)\sum_{k=0}^{n}\binom{n}{k}\frac{\binom{2k}{k}}{(-6)^k}\equiv\left(\frac{3}{p}\right)3^{p-1}\pmod{p^2},$$

where $\left(\frac{\cdot}{p}\right)$ stands for the Legendre symbol.

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