

New congruences on multiple harmonic sums and Bernoulli numbers

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Abstract. Let \mathcal{P}_n denote the set of positive integers which are prime to n . Let B_n be the n -th Bernoulli number. For any prime $p \geq 11$ and integer $r \geq 2$, we prove that

$$\sum_{\substack{l_1+l_2+\dots+l_6=p^r \\ l_1, \dots, l_6 \in \mathcal{P}_p}} \frac{1}{l_1 l_2 l_3 l_4 l_5 l_6} \equiv -\frac{5!}{18} p^{r-1} B_{p-3}^2 \pmod{p^r}.$$

This extends a family of curious congruences. We also obtain other interesting congruences involving multiple harmonic sums and Bernoulli numbers.

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