MATHEMATICS OF COMPUTATION, VOLUME 27, NUMBER 122, APRIL, 1973

Three Thirteens

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Abstract. From a computed solution to the Tarry-Escott problem two sets of thirteen integers are obtained having equal sums of odd powers through the thirteenth.

A recent computer search yielded a solution to the Tarry-Escott problem $\sum_{i=1}^{n} a_i^j = \sum_{i=1}^{n} b_i^j$, $j = 1, 2, \cdots, k$, with $k = 14$, $n = 26$. The terms $a_1, a_2, \cdots, a_{26}$ are 1, 8, 9, 22, 23, 34, 36, 48, 50, 62, 75, 83, 87, 89, 95, 97, 109, 130, 132, 134, 136, 156, 157, 158, 171, 173, and $b_i = 175 - a_i$, $i = 1, 2, \cdots, 26$. Previously the solution with fewest terms for $k = 14$ had $n = 30$ [1]. From the new solution it is possible to derive $\sum_{i=1}^{13} \{b_i - a_i\}^x = \sum_{i=14}^{26} \{a_i - b_i\}^x$ or $1^x + 9^x + 25^x + 51^x + 75^x + 79^x + 103^x + 107^x + 129^x + 131^x + 157^x + 159^x + 173^x = 3^x + 15^x + 19^x + 43^x + 85^x + 89^x + 93^x + 97^x + 137^x + 139^x + 141^x + 167^x + 171^x$ for $x = 1, 3, 5, 7, 9, 11, 13$ in which there are 13 terms on each side of the equation.

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1. A. Gloden, *Mehrgradige Gleichungen*, 2nd ed., Noordhoff, Groningen, 1944, p. 58. MR **8**, 441.

Received August 31, 1972.
AMS (MOS) subject classifications (1970). Primary 10B15.
Key words and phrases. Thirteenth-order equations, Tarry-Escott problem.