Overpseudoprimes, and Mersenne and Fermat numbers as primover numbers

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We introduce a new class of pseudoprimes-so called "overpseudoprimes to base b", which is a subclass of strong pseudoprimes to base b. Denoting via $|b|_n$ the multiplicative order of b modulo n, we show that a composite n is overpseudoprime if and only if $|b|_d$ is invariant for all divisors $d>1$ of n. In particular, we prove that all composite Mersenne numbers $2^{p}-1$, where p is prime, are overpseudoprime to base 2 and squares of Wieferich primes are overpseudoprimes to base 2. Finally, we show that some kinds of well known numbers are overpseudoprime to a base b.

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