RICHARD P. BRENT, Australian National University, Canberra, ACT 2601, Australia. Factorization of the Eleventh Fermat number. Preliminary report.

Of the Fermat numbers \( F_n = 2^{2^n} + 1 \), only \( F_1 \) to \( F_4 \) are known to be prime; certainly \( F_5 \) to \( F_{21} \) are composite. However, the only complete factorizations known until now are those of \( F_5 \) (Euler), \( F_6 \) (Landry), \( F_7 \) (Morrison and Brillhart, 1975), and \( F_8 \) (Brent and Pollard, 1981). This abstract announces the complete factorization of the 617-digit Fermat number \( F_{11} = 2^{2^{11}} + 1 \). In fact

\[
F_{11} = 319489.974849.167988556341760475137.356084190644583920513.p_{564}
\]

where the two 6-digit factors were already known (Cunningham, 1899), the 21-digit and 22-digit prime factors were found using the two-phase elliptic curve algorithm on a Fujitsu VP100 computer, and \( p_{564} \) is a 564-decimal digit prime (primality proof by F. Morain, using the method of Atkin). The provision of computer time by the ANU Supercomputer Facility is gratefully acknowledged.

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