Discrete Mathematics
Drill

Moshe Rosenfeld

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moishe@u.washington.edu

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1 Number Theory

All calculations can be done by paper-pencil.

1. calculate: $7^{644} \bmod 645$, $11^{644} \bmod 645$.
2. calculate: $7^{35461} \bmod 11$.
3. calculate: $7^{35461} \bmod 33$.
4. calculate: $7^{35461} \bmod 297$.
5. calculate: $7^{-1} \bmod 33$.
6. Two factors of 294409 are 37 and 73. Find the other factors. what is $\phi(294409)$?
7. * Calculate $2^{294408} \bmod 294409$.
8. * Calculate $7^{294408} \bmod 294409$.
9. ** Prove that if $gcd(a, 294409) = 1$ then $a^{294408} \bmod 294409 = 1$.
10. **Prove that if a, b are positive integers then there are integers n *and* m such that $m \cdot (2^a - 1) + n \cdot (2^b - 1) = 2^{gcd(a,b)} - 1$.