1. Find 7^{121} mod 13.

2. Find 3^{216} mod 130. (Hint: $130 = 2 \cdot 5 \cdot 13$.)

3. An integer $a \not\equiv 0$ is a <u>quadratic residue</u> of p if $x^2 \equiv a \pmod p$ has a solution. What are the quadratic residues of 11?

4. Show that if $p \nmid a$, $x^2 \equiv a \pmod p$ has either no solution or two distinct solutions mod p.

5. Show that if p is an odd prime, there are exactly $\frac{p-1}{2}$ quadratic residues among the integers $1, 2, \ldots, p-1$.

6. Show that a is a quadratic residue mod p iff $a^{\frac{p-1}{2}} \equiv 1$ mod p.