Collected Problems:

1. Calculate the following Jacobi Symbol:
   (a) $\left(\frac{5}{21}\right)$
   (b) $\left(\frac{111}{1001}\right)$
   (c) $\left(\frac{1009}{2307}\right)$
2. For which positive integers n that are relatively prime to 15 does the Jacobi symbol $\left(\frac{15}{n}\right) = 1$.
3. Suppose that $n = pq$, where p and q are odd primes. We say that the integer a is a pseudo-square modulo n if a is a quadratic nonresidue of n, but $\left(\frac{a}{n}\right) = 1$.
   (a) Show that if a is a pseudo-square modulo n, then $\left(\frac{a}{p}\right) = \left(\frac{a}{q}\right) = -1$.
   (b) Find all the pseudo-squares modulo 21.
4. Let $n = 15841$.
   (a) Factor n to show that n is not prime.
   (b) Show the n is a Carmichael number.
   (c) Show 2 is not an Euler witness for n.
   (d) Show 2 is not a Rabin-Miller witness for n.

Non-Collected Problems:

1. Calculate the following Jacobi Symbol:
   (a) $\left(\frac{2663}{3299}\right)$
   (b) $\left(\frac{10001}{20003}\right)$
2. Let n be an odd square-free number (i.e. all of its prime factors are unique). Show that there is an integer a such that $\gcd(a, n) = 1$ and $\left(\frac{a}{n}\right) = -1$.