Exercises 1.4 Revised

2. Construct the addition and multiplication table for $\mathbb{Z}_n$ when $n$ is 4, and when $n$ is 5.

3. Find the following inverses if they exist:
   (i) the inverse of 31 modulo 11
   (ii) the inverse of 237 modulo 91
   (iii) the inverse of 18 modulo 19.

5. Show that no integer of the form $8k + 7$ can be the sum of three squares.

7. Let $p$ be a prime number. Show that
   $$(p-1)! \equiv -1 \pmod{p}.$$  

8. Give a new proof of the Fundamental Theorem of Arithmetic that starts as follows:
   **Proof.** Let $S$ be the set of integers each $> 1$ that do not have a unique factorization into primes.