Problem 1. Prove that every positive integer can be written as a product of prime numbers.

Problem 2. Let a and b be integers that are not both zero and let d be their greatest common divisor. Prove that it is possible to find integers x and y satisfying the equation $d = ax+by$. You may use without proof that the greatest common divisor of a and b exists. (Here are several different suggestions: Try doing induction on b and then doing induction on a; try taking S to be the set of all natural numbers of the form $ax + by$ and letting e be its least element, then showing $d = e$; try using the division algorithm.)