Name:

Problem 0 (2 points)**.** State the Fundamental Theorem of Arithmetic.

Problem 1 (4 points)**.** Let a and n be positive integers. Prove that if $[a] = [1] \mod n$ then $(a, n) = 1$.

Problem 2 (4 points)**.** True or false? Justify your answer with a proof if it is true or a counterexample if it is false.

$$\text{Given positive integers } a \text{ and } n, \text{ if } (a, n) = 1, \text{ then } [a] = [1] \mod n.$$

Problem 3 (Bonus)**.** Let a be any positive integer, and b its last (i.e., units) digit. Suppose that the last digit of a^d is 1. Prove that the last digits of a^n and b^r are the same, where $n = dq + r$ with $q, r \in \mathbb{Z}$ and $0 \leqslant r < d$.