

4. [2 points] Decide whether the given functions are one-to-one/injective, onto/surjective, or bijective. For each blank cell in the table, write “Yes” if the function has the property, and “No” otherwise. You do not need to show your work.

In the following, let A^* be the set of finite strings of a 's and b 's. For example, $aaba$, bb , and the empty string λ are all in A^* . Recall that $\mathbb{N} = \{0, 1, 2, \dots\}$ and \mathbb{Z} is the set of integers.

Function	one-to-one	onto	bijective
$f: \mathbb{Z} \rightarrow \mathbb{Z}$ where $f(x) = x + 6$			
$f: \mathbb{Z} \rightarrow \mathbb{Z}$ where $f(x) = x^2 - 1$			
$f: \mathbb{Z} \rightarrow \mathbb{Z}$ where $f(x) = x^3 - 1$			
$f: A^* \rightarrow \mathbb{N}$ where $f(x)$ equals the length of x			
$f: A^* \rightarrow A^*$ where $f(x) = xx$			
$f: A^* \rightarrow A^*$ where $f(x)$ equals the reverse of x			

5. [2 points] In RSA, let $p = 47$ and $q = 43$. Then $n = 2021$ and $\phi(n) = 1932$. Pick $e = 541$. Use the Euclidean algorithm to find the value of d .