

# Discrete Math

Active Exercise

**Aviv Vaknin**

316017128

## 1 Create an injective and surjective function from $\mathbb{N}$ to the natural numbers that can be divided by 5

We'll define:

$$\begin{aligned}f &: N \longrightarrow M \\f(n) &= 5n\end{aligned}$$

We'll define  $f$ 's inverse function:

$$\begin{aligned}f^{-1} &: M \longrightarrow N \\f^{-1}(n) &= \frac{n}{5}\end{aligned}$$

Now, we need to show that  $f$  is injective and surjective.  
We'll do that by showing that:

$$\begin{aligned}f \circ f^{-1} &= id_M \\f^{-1} \circ f &= id_N\end{aligned}$$

$$\begin{aligned}f \circ f^{-1}(n) &= f(f^{-1}(n)) = f\left(\frac{n}{5}\right) = 5 \cdot \frac{n}{5} = n \\f^{-1} \circ f(n) &= f^{-1}(f(n)) = f^{-1}(5n) = \frac{5n}{5} = n\end{aligned}$$

Therefore, we've shown that:

$$\begin{aligned}f \circ f^{-1} &= id_M \\f^{-1} \circ f &= id_N\end{aligned}$$

□

## 2 Create an injective and surjective function from $\mathbb{N}$ to $\mathbb{N} \times \{1, 2, 3\}$

$x$