

2-Element Sets

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Proposition 0.1. Let a, b be distinct objects. Then $|\{a, b\}| = 2$.

Proof. Define

$$f(x) = \begin{cases} 0 & x = a \\ 1 & x = b \end{cases}$$

for $x \in \{a, b\}$. Then f is a map from $\{a, b\}$ to 2. f is injective and surjective onto 2. Hence f is a bijection between $\{a, b\}$ and 2. Consequently $\{a, b\}$ and 2 are equinumerous. Thus $|\{a, b\}| = |2| = 2$. \square